OCTOBER 1961

Plant Engineering

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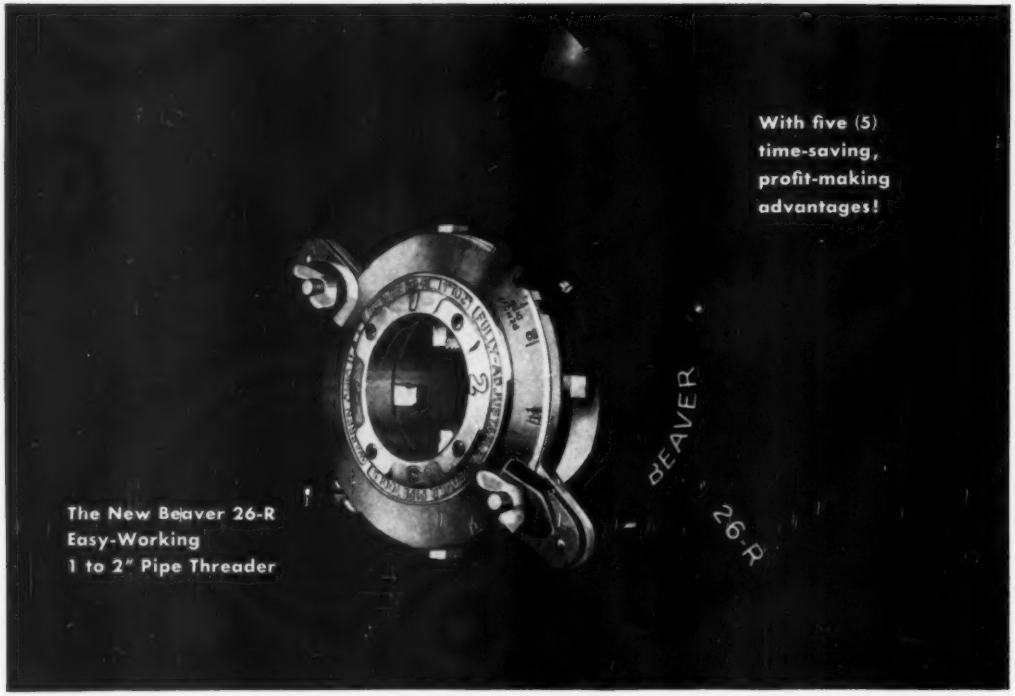
Volume 3, No. 10

The magazine that helps plant engineers with their everyday problems



Why "*Fully-Adjustable*" Threaders are Better!

● The new Beaver No. 26-R "fully-adjustable" pipe threaders are better because:

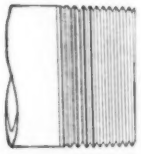
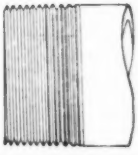
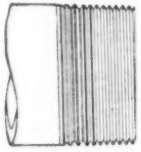
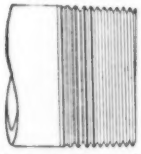
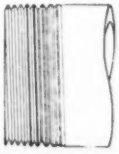
1. They cut standard, oversize or undersize threads of uniform length.
2. The cam-controlled dies adjust as a single unit — which means that all die segments cut equally.
3. The Beaver 26-R is the only 1 to 2-inch threader on the market which will cut either standard "taper" or electric "straight" conduit threads.
4. No die-changing — one set of dies threads four sizes: 1, 1¼, 1½ and 2".
5. The Beaver 26-R is the ONLY 1 to 2" easy-working pipe threader on the market which is "fully-adjustable". All others are semi-adjustable.

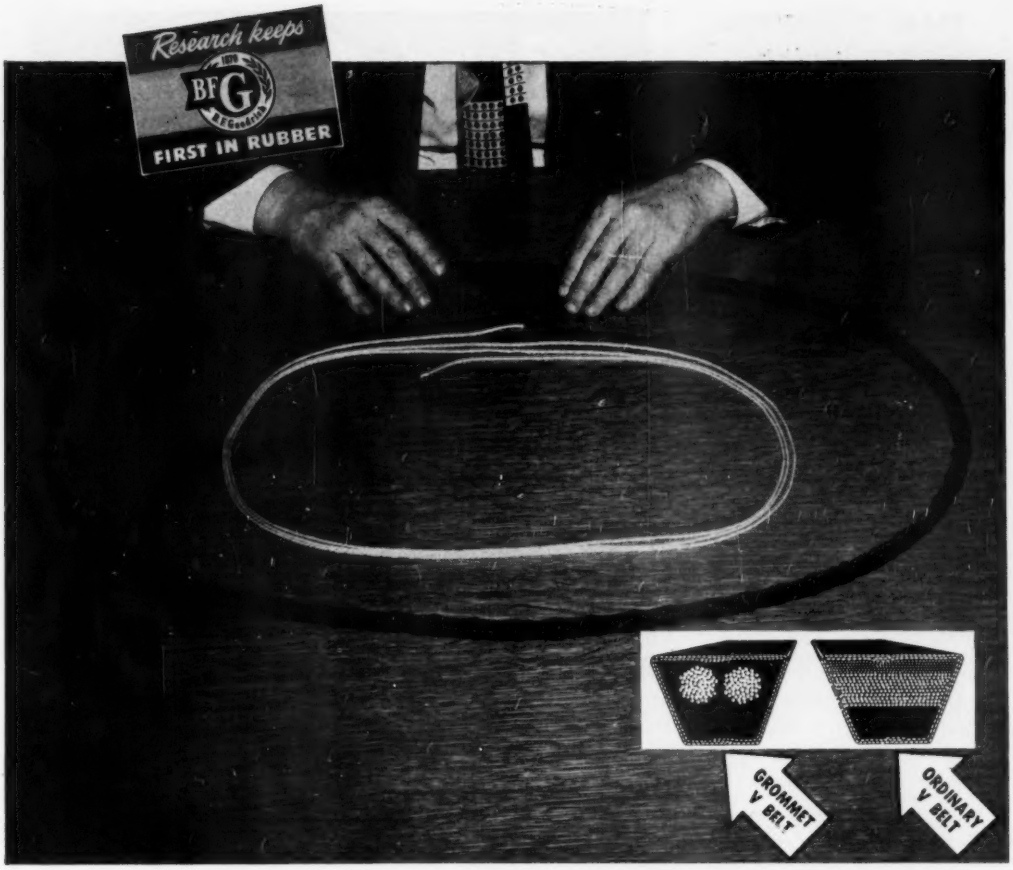
Write today for new Complete Catalog No. 49. Address Beaver Pipe Tools, Inc., 210-300 Dana Avenue, Warren, Ohio, U.S.A.

YOUR OLD-STYLE NO. 26'S CAN BE REBUILT!

Yes, your old-style No. 26's can be rebuilt and converted into new No. 26-R's at a substantial saving. Look around your shop—perhaps you have some old No. 26's which you can have rebuilt.

BEAVER PIPE TOOLS

THE BEAVER WAY	THE OTHER WAY
 *Standard Thread— Standard Length*	 *Standard Thread— Standard Length*
 *Oversize Thread— Standard Length*	*Oversize Thread— Too Long*
 *Undersize Thread— Standard Length*	 *Undersize Thread— Too Short*



What is this thing called a grommet?

New B. F. Goodrich grommet V belts cut costs 20 to 50%

NO—a grommet is not an ordinary cable. It is a patented construction in which heavy cord is wound upon itself to form an endless loop. An ordinary cable is merely a twisted cord, the ends of which must be overlapped to make a loop. (See the picture above.) The difference is important to you, because a B. F. Goodrich grommet V belt delivers 20 to 50% more V belt value *at no extra cost.*

Grommet belts are more flexible—They have no splice, no stiff section where cords overlap (85% of failures of ordinary belts occur in overlapped sections). B. F. Goodrich belts have twin grommets, no fabric or plies in the middle of the belt that stiffen it and generate heat. They have more elasticity, less permanent stretch than any other belt.

Stand shocks better—Actual running tests in field and laboratory show that B. F. Goodrich grommet V belts have a higher safety factor, much greater ability to withstand shock load than do ordinary V belts—actually lasted 20 to 50% longer!

No "lost" cords—In an ordinary V belt much of the cord strength is lost—wasted because all the cords don't pull their share of the load. In a grommet belt all the cords work all the time.

Only BFG has the grommet belt—Twin grommet construction is an exclusive, patented B. F. Goodrich development (U.S. Patent No. 2,233,294). Make sure you get genuine grommet V belts, (for the present made only in the larger—the D and E sizes). Ask your BFG salesman to show you his "X-ray" belt that illustrates grommet construction clearly. *The B. F. Goodrich Company, Industrial and General Products Division, Akron, Ohio.*

Grommet V Belts BY

B.F.Goodrich

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CCA

'Round About with the Editors

Sins of Omission — on Belt Uses and Locations

FOR THE article What Belt to Use—and Where digested on page 10 of the August issue the writer presumes that the letters shown in Table I, which is a part of the article, mean: F, for fair; G, for good; and VG, for very good. If such is the case, believe it would have been advisable to mention it. A key makes understanding much easier for it saves hunting around to ascertain just what it is all about. *C. E. Thompson, Berks Eng. Co., Reading, Pa.*

EDITOR'S NOTE: Mr. Thompson is right on both counts. The code is as he interprets it and should have been included as part of the table, but was inadvertently trimmed off by the engraver when the table was reproduced.

Our Friends are Good Missionaries

THE AUTHOR of PLANT ENGINEERING seems to know what it takes to be a plant engineer judging from his penetrating discussion . . . It is a pleasure to us who live daily with this field to realize that there are some who write and also know. I am sure further reading of the issue will enhance this opinion. Thank you for thinking of me, your thoughts reflect your usual good judgment. *Elmer Perrine, Philadelphia, Pa.*

EDITORS NOTE: This letter, written last December, just reached us through Roy Woodleton of New York who sent his copy to Mr. Perrine after reading it. The reference is to Plant Engineering as a Profession from page 42 of the December 1948 issue. We also like S. A. Simonson's (North Chicago, Ill.) remark "In reading the articles I know they have been written by someone who has been 'through the mill'."

Don't Blame the Editors— But Check your Copy

WE WOULD appreciate receiving a reprint of the article How to Build Safety into Transformer Installation on pages 38 and 39 of the September, 1949, issue of PLANT ENGINEERING. There is a misprint in our copy of the magazine and this particular article is not complete. *H. C. McQueen, Manufacturing Dept., General Motors Overseas Operations.*

WE ARE this day in receipt of the September issue . . . and note that in the copy we received pages 38, 39, 42 and 43 are blank. Would you be so kind as to send us a replacement copy so that we may have the complete magazine? *George C. Dunn, Executive Vice President, Dunn Paper Co.*

EDITORS NOTE: A score of defective hand bound copies of the early press run were inadvertently mailed. If you received one of these let us know.

Recent Changes, News and Notes

C. C. Hursh is now Superintendent of Maintenance at Armco Steel Corp., East Works Plant at Middletown, O. with **R. W. Martin** and **J. J. Timberlake** as assistants. Armco is the former American Rolling Mill Co.

• • •

Stephen M. Batori, long active in engineering circles and vice president of the Puget Sound Engineering council, recently formed his own consulting engineering firm under the name of Stephen Batori & Co., with offices at 200 James St., Seattle, Wash. Investigations and reports; coordination of plant and procedures; factory layout and design; testing; power development and application.

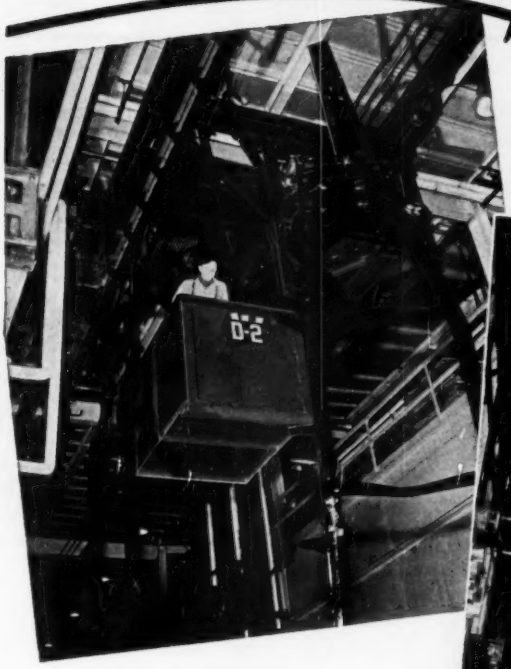
• • •

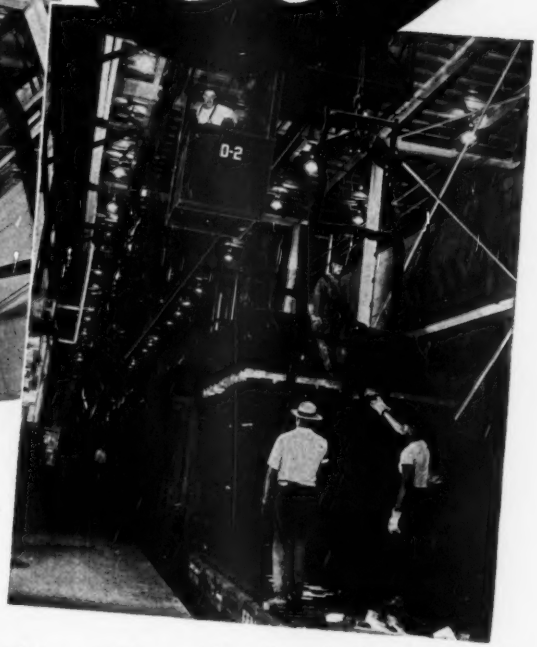
A SINGLE MAIL delivery brought the following: A purchase order from Ohio for $69.50 to be forwarded with the request for rush handling; a rush inquiry from California for data on a special application approximating $1600; a detailed drawing from Massachusetts of a new 8000 sq ft industrial plant office building to be forwarded to a manufacturer for cost estimates and design details of a new product. We appreciate the opportunity to be of service to readers and will gladly act as a clearing house for matters of this kind.

• • •

EQUALLY IMPORTANT is the matter of prompt delivery of literature and information on new products which you have requested. In the same mail mentioned above were two followups on data previously requested but not yet received. If your request is not acknowledged by the manufacturer in a reasonable period, say 4 to 6 wk let us know so we can follow through. We want to improve our service to you and manufacturers are anxious to improve their procedures so as to eliminate all unnecessary delay.

CAR LOADING TIME REDUCED 50%





To load 5440 automobile frames per day in railroad cars for transfer to assembly lines, formerly required 748 man-hours of dangerous labor. Since the installation of an American MonoRail specially designed system, this time has been reduced 50% and at the same time furnishing a safe method of performing the same operation.

The equipment consists of 2 special RailMaster cranes operating from cab control with variable speeds of 250 feet per minute for changing location from one car to another, and a micro-speed of 7 inches per minute to synchronize with the conveyor bringing the frames to the car. The jib boom operates at 10 r.p.m. variable speed to permit handling of a frame every 10.6 seconds with perfect safety.

Let an American MonoRail engineer show you how American MonoRail Overhead Handling equipment will pay and save in your plant.

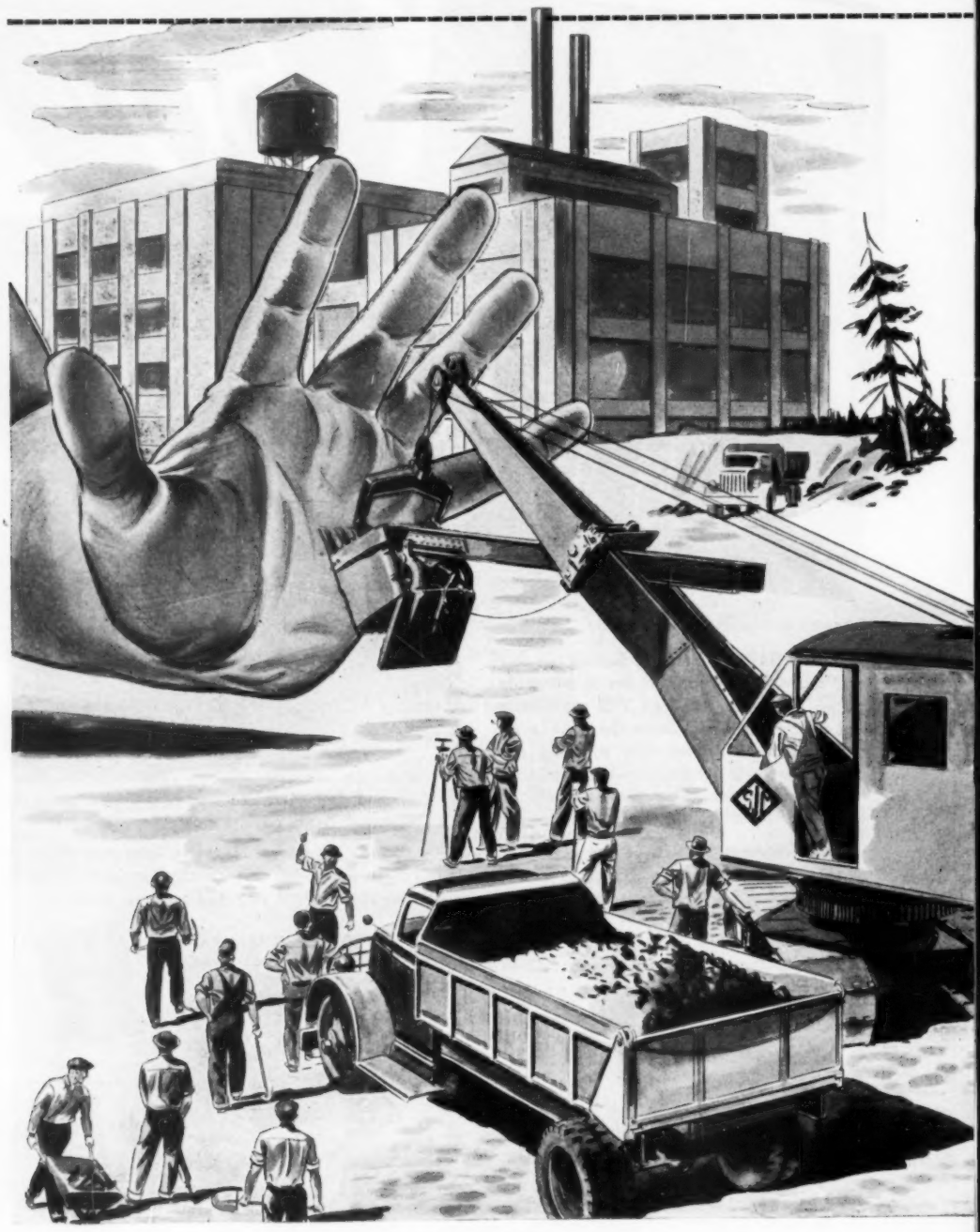
SEND FOR BULLETIN C-1. A 56-page book showing successful applications of American MonoRail Systems.

THE AMERICAN MONORAIL COMPANY

13123 ATHENS AVENUE **CLEVELAND 7, OHIO**

YOU CAN BE **SURE**.. IF IT'S

Westinghouse



STOP!

...have you planned your power distribution system?

Building a new production area? Everything laid out to do the job you've planned? Sure it is.

BUT . . . have you planned for the *best system* to power your new production lines? Their ability to produce depends directly on this power system.

Will your distribution system save you money *over a period of years?* Have you thought about *future* loads? Is it flexible enough to handle shifting production lines? Will it provide voltage regulation you need?

Whatever the problem—Westinghouse can help you find the "one best" system for *your* plant.

Our engineers have worked with *all types* of industries for a good many years. They have found new and better answers to *all* phases of power distribution. Westinghouse offers this co-operation to all Industry in getting power to do the best job at the lowest possible cost. J-94788

Here's REAL help for your "System Planning"

1. A new 34-page booklet: "Industrial Plant Distribution Systems", B-4045. Fact-filled pages and colorful diagrams present the basic systems most widely used in Industry today. Find how to choose the *best system* for *your* plant.

2. System Selector: A wealth of information condensed to a pocket-size selector! In a matter of minutes you can make preliminary decisions on the system that answers *your* requirements.

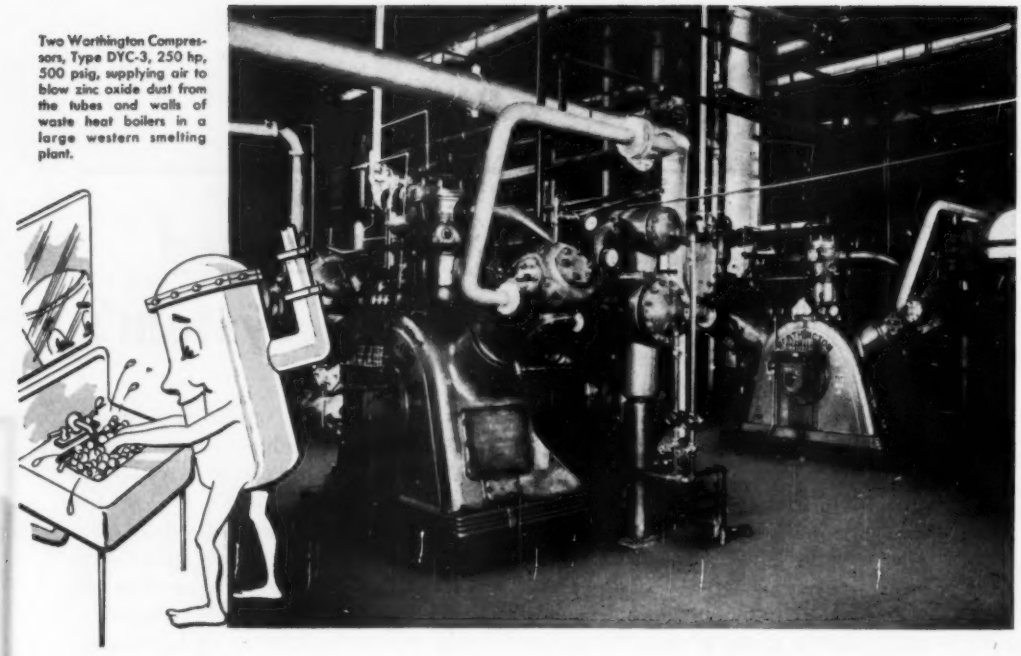
3. Color Movie: Get all the facts visually! This 16-mm, full-color movie is a 20-minute dramatization that will point the way to new economies in plant power distribution. Ask one of our representatives for a free showing of "The Right Power Distribution System". No obligation, of course.

If you're expanding or building a new production area . . . get this invaluable information NOW!

Call your nearest Westinghouse office, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

Westinghouse

SYSTEM PLANNING SERVICE



Two Worthington Compressors, Type DYC-3, 250 hp, 500 psig, supplying air to blow zinc oxide dust from the tubes and walls of waste heat boilers in a large western smelting plant.

Here's Your Modern, Money-Saving Way To Make Boilers "Come Clean"!

Worthington Compressors Do A Real Job Of Soot Blowing... Faster, Better, At Less Cost!

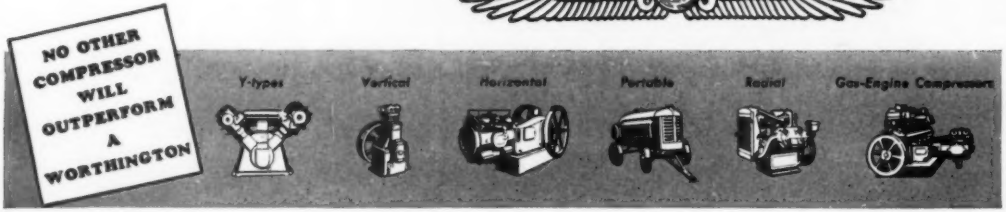
Boiler cleaning by hand is a messy, makeshift carry-over from the horse-and-buggy era. Today, soot-blowing by compressed air is an economic necessity. Originally developed for low pressure boilers, air soot blowing has shown so many advantages over steam as a cleaning agent that its use has now extended to central stations and big power plants throughout the nation.

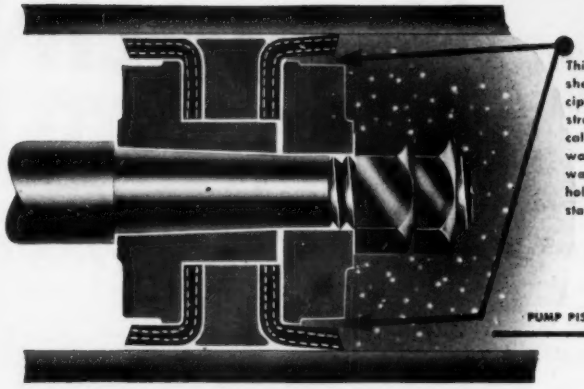
The reasons are plain. Air soot blowing saves fuel and feed-water make-up, while lessening the possibility of tube erosion. It uses inexpensive, low-temperature piping, with piping insulation eliminated. It reduces soot blower maintenance, provides a dryer blowing medium and a more effective means of slag removal. Finally, its complete adaptability to automatic control reduces costly manual operation throughout long years of service.

"Heart" Of Every Soot Blowing System

is its compressors . . . and Worthington builds these for every application . . . builds them to give you longer, quieter, smoother service — and air at lower cost. For further facts proving *there's more worth in Worthington*, write for booklet, "Worthington Compressors for Soot Blowing". *Worthington Pump and Machinery Corporation, Compressor Division, Buffalo, N. Y.* KB-9

WORTHINGTON





This greatly exaggerated diagram shows the Darcova Pumcup principle. On pressure side of each piston stroke, flexible Pumcup is automatically forced against liner or cylinder wall. Firm, uniform contact all the way around eliminates slippage, holds volumetric efficiency at constant high in spite of gradual wear.

PUMP PISTON MOTION

THEY NEVER RELAX
when the pressure is on!

HERE is a piston packing that actually takes *advantage* of the fluid pressure built up in reciprocating pumps and in air or hydraulic mechanisms. The illustration above shows how Darcova Pumcups utilize this pressure . . . how they hug the cylinder wall on every work-stroke of the piston, preventing needless slippage.

Then, too, friction between the Pumcup and cylinder is automatically "pressure-equalized" all the way around for a uniformity of wear otherwise impossible. And, in contrast to other types of packing, fluid slippage does not increase with wear. Peak volumetric efficiency is retained even when Pumcup wear is far advanced.

Consequently, Pumcups offer two mighty important advantages. First, downtime and material and maintenance costs are cut to a fraction because Pumcups outlast other types of packing many times over. Secondly, volumetric efficiency is held constant.

Everything considered, it is easy to see how thousands of Darcova Pumcup users are saving up to $100 per pump per year. Easily installed, Pumcups replace ordinary packing in reciprocating pumps and in air or hydraulic mechanisms. They are precision built in ½ to 42 inch sizes and in many different textures for practically all fluids. pressures and temperatures.

DARCOVA
THE ORIGINAL COMPOSITION CUP

***FREE BULLETIN**—For a free bulletin containing complete information, write, or use the coupon below.*

DARLING VALVE & Manufacturing Co.
WILLIAMSPORT, PA.

Darling Valve & Mfg. Co., Williamsport 14, Pa.
Please send me the free bulletin checked below:
☐ No. 4401 Darcova Pumcups for reciprocating pumps.
☐ No. 4502 Darcova Pumcups for air or hydraulic mechanisms.

Name_____
Company_____
Address_____
City_____ State_____

Tramrail HANDLING WHICH WILL HELP *You?*

GANTRY CRANES SOLVE PRODUCTION PROBLEMS

Inexpensive single-leg gantry cranes are solving production problems in many plants. They usually work under heavy overhead cranes and take care of light local handling.

Several gantry cranes often can be obtained for the cost of a heavy overhead crane.

20 FOOT BARS Stored and Handled Efficiently

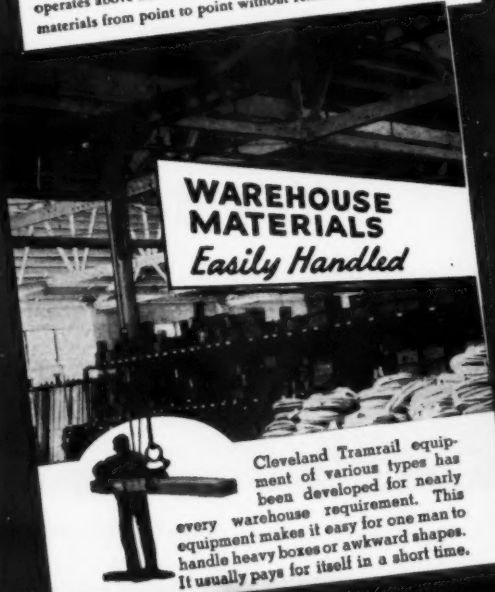
Simple, inexpensive overhead tramrail cranes make it easy to handle long, unwieldy bars and store them in racks where readily found. One man can easily and quickly place a heavy bar into or take out of storage and deliver to any point covered by the crane.

CAB-OPERATED CARRIER HANDLES LONG PIPE AND BEAMS

It is difficult to handle long pipe and beams through narrow shop aisles and around corners on floor conveyances. Cleveland Tramrail equipment makes this work fast and easy because it operates above floor obstacles and traffic. It hoists and delivers materials from point to point without rehandling.

675 MOLDS EVERY HOUR

Every hour 675 molds are carried to the pouring section and then through cooling and shakeout areas on this Cleveland Tramrail continuous foundry mold handling system. Because travel machinery is overhead, away from dirt and hot metal, production interruptions and maintenance are kept at minimum!



WAREHOUSE MATERIALS *Easily Handled*

Cleveland Tramrail equipment of various types has been developed for nearly every warehouse requirement. This equipment makes it easy for one man to handle heavy boxes or awkward shapes. It usually pays for itself in a short time.

Ideas

SAVES $10,000 PER YEAR

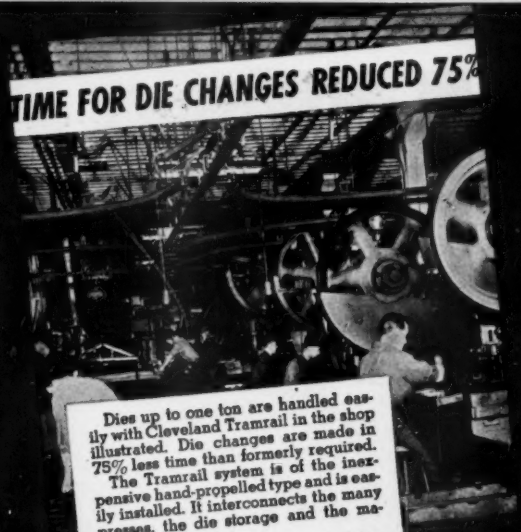
This great saving was made with a Cleveland Tramrail cab-operated crane and motor-driven paper roll grab, because of better handling efficiency and elimination of damage losses due to crushed edges, cuts and tears.

STORING AND HANDLING 1728 REELS

The three racks shown above are 63 feet long and will accomodate 576 reels per row or a total of 1728 reels. This number of 24" reels will store 300,000 pounds of wire.

The reels are taken to or removed from the racks by means of a Cleveland Tramrail overhead rail system with easily operated chain hoists and special reel grabs. Each reel space is numbered and each reel is weighed before placing on racks, which makes keeping a perpetual inventory easy.

TIME FOR DIE CHANGES REDUCED 75%

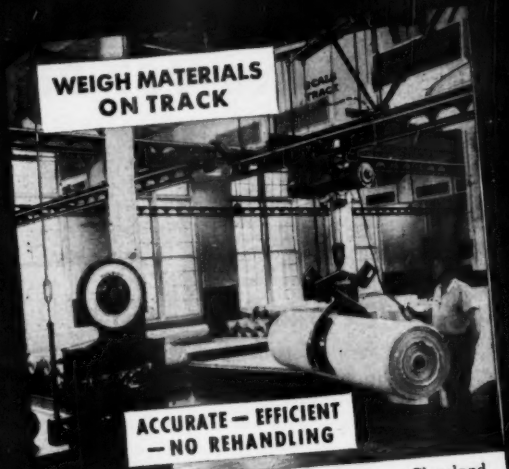


Dies up to one ton are handled easily with Cleveland Tramrail in the shop illustrated. Die changes are made in 75% less time than formerly required.

The Tramrail system is of the inexpensive hand-propelled type and is easily installed. It interconnects the many presses, the die storage and the machine shop.

No accidents in the handling of dies and materials have occurred since this system was installed 4 years ago.

WEIGH MATERIALS ON TRACK



ACCURATE — EFFICIENT — NO REHANDLING

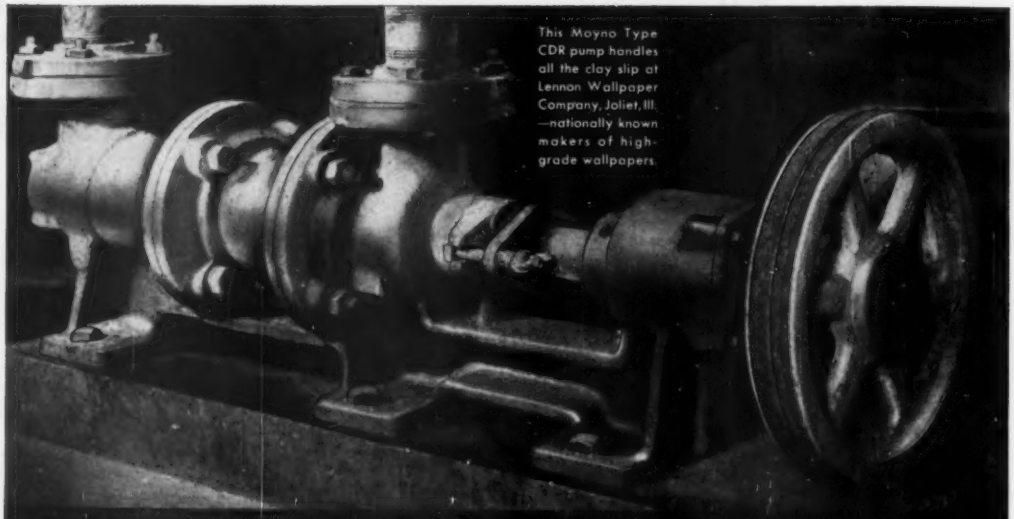
Rolls, or loads of any materials, conveyed on a Cleveland Tramrail overhead system, are quickly and accurately weighed without handling by running the carrier onto a track section which is connected to a floor scale.

GET THIS BOOK!

BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy.

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
7548 EAST 284th STREET - - - WICKLIFFE, OHIO

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT



This Moyno Type CDR pump handles all the clay slip at Lennon Wallpaper Company, Joliet, Ill. —nationally known makers of high-grade wallpapers.

How Lennon CUT Pump Maintenance

...AND GOT BETTER PUMPING, TOO

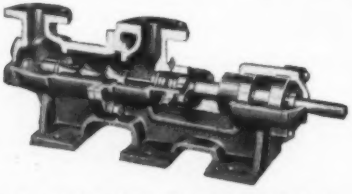
Lennon Wallpaper Company's experience is a tip on how *you* can get *better* pumping. Maintenance problems disappeared when they installed an R & M Moyno "Progressing-Cavity" pump to handle clay slip (for color coating). After a year's operation, *not even a dime* has been spent for repairs.

"NO TROUBLE AT ALL"

The Moyno has handled over 300,000 gallons of slip, pushing it through a 2½-inch pipe, 180 ft. horizontally and 20 ft. vertically. "We're very happy with our Moyno," says R. Dagon, Superintendent. "It's been running steadily for well over a year, and we've had no trouble at all."

TYPES FOR ALL NEEDS

Moynos pump virtually *everything* from volatile liquids to non-pourable pastes. They pass particles and solids in suspension—resist chemicals and abrasives—save maintenance *and money* by constant, dependable operation. They meter flow, self-prime, and reverse; deliver smooth, *non-pulsating* discharge at pressures to 1000 p.s.i. If *you're* having pumping troubles, call in a Moyno man—chances are he has *your* answer, too. Distributors from coast to coast. Write today.



ONLY ONE MOVING PUMPING PART

A helical rotor turns in a double-helical stator to form progressing cavities. Continuous, ever-changing seal lines prevent concentrated wear, make parts last longer.

Free Booklet Gives Details

"A Turn for the Better" explains "progressing-cavity" pumping; lists uses; gives types and specifications. Just ask for Book No. P-22E.

R & M MOYNO® PROGRESSING-CAVITY PUMP

ROBBINS & MYERS, INC. MOYNO PUMP DIVISION
Springfield 99, Ohio • Brantford, Ontario

MOTORS • HOISTS • CRANES • FANS • MOYNO PUMPS • FOUNDED 1878

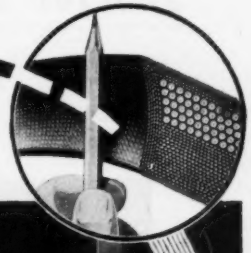
You can actually *feel* the sides of a belt *change shape* as the belt bends.

In Two Minutes You Can See Exactly How . . .

The Concave Side

(U.S. Patent No. 1813698)

SAVES Your Transmission DOLLARS



Take *any* V-belt in your hands and bend it as it bends in going around a pulley. You will see that the top of the belt, being under *tension*, grows *narrower*. The body, under compression, *widens*. The sides *bulge out*.

This shape change—in a *straight-sided* V-belt—is shown in Figures 1 and 1-A, below.

Straight-Sided V-Belt

How Straight-Sided V-Belt Bulges in Sheave-Groove.

Now look at Figures 2 and 2-A. There you see how the *same shape change* affects the V-belt built with the precisely engineered *Concave Side* (U.S. Patent No. 1813698).

Gates Vulco Rope with Concave Side.

No Side Bulge. Precise Fit in Sheave Groove.

The top of the belt narrows, the body widens. But the sides *merely straighten—and* the new shape *exactly fits* the sheave groove!

Two savings result. (1) Uniform side-wall wear *—longer life!* (2) Full side-wall grip on the pulley carries heavier loads and *sudden load increases* without slipping; saves belts, saves *power!*

REG. U. S. PAT. OFF.

The Mark of SPECIALIZED Research

The Concave Side is *MORE IMPORTANT NOW Than Ever Before*

Because the sides of a V-Belt are what actually drive the pulley, it is clear that any increased load on the belt means a heavier load that must be transmitted to the pulley directly through the belt's sidewalls.

Now that Gates SPECIALIZED Research has made available to you SUPER Vulco Ropes—carrying fully 40% higher horsepower ratings—the life-prolonging Concave Side is naturally more important in conserving belt life today than ever before.

4910

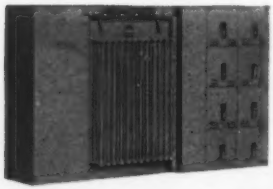
GATES VULCO ROPE DRIVES

Engineering Offices and Jobber Stocks IN ALL INDUSTRIAL CENTERS of the U. S. and 71 Foreign Countries

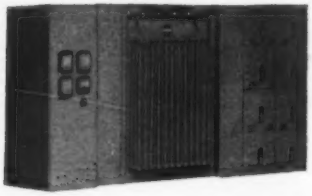
THE GATES RUBBER COMPANY
DENVER, U.S.A.
The World's Largest Makers of V-Belts

New load-center unit

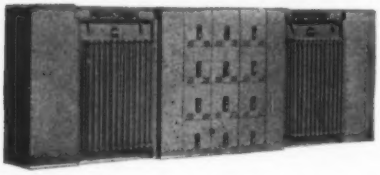
Shorter shipments, when you order 'Selected Standards'



Typical 500 kva G-E *selected standard* load-center unit substation (standard arrangement). Unit consists of primary interrupter switch, liquid-filled transforming section, and low-voltage feeder switching section with the new Type AK-1 drawout air circuit breakers. Reverse arrangement is also available at same price.



Typical 500 kva G-E *selected standard* load-center unit substation with liquid-filled transforming section, metal-clad air power circuit breaker for incoming line-protection, and low-voltage feeder switching section with the new Type AK-1 drawout air circuit breakers.



G-E *selected standard* double-ended load-center unit substation rated 1500 kva with primary interrupter switches, liquid-filled transforming sections, and low-voltage feeder switching section with G-E Type AK-1 drawout air circuit breakers arranged for secondary selective service.

Based on surveyed demands of industry and proposed NEMA specifications, *selected standard* ratings have been introduced by General Electric to bring you these efficient new load centers on shorter shipment. The most popular *selected standard* ratings are . . .

Low voltage	480△ or Y, 208Y/120 volts
High voltage	2.4, 4.16, 4.8, 12, 13.2, 13.8 kv, delta
Kva ratings	300, 500, 750, 1000, 1500, 2000

Certain other *selected standard* load centers are available. Contact your G-E sales representative for further information.

SHORTER SHIPMENTS By ordering *selected standards*, you get 20 per cent shorter shipments on Pyranol and dry-type load centers. Deliveries are in line with average plant construction schedules and it is suggested that load centers be ordered when construction begins.

HIGH IMPULSE LEVELS Pyranol unit substations with their inherently high impulse levels are particularly suitable for locations that are subject to switching surges and lightning.

ECONOMICAL, too, is a G-E load-center power distribution system . . . no heavy, costly low-voltage feeders, no "piecemeal" purchases, no divided responsibility.

SAVE TIME, also, because G-E *selected standard* load centers eliminate weeks spent over drawing boards detailing individual items; you'll save time because G-E factory-assembled unit substations are quickly and easily installed—in the center of the load area—with lower material and labor costs then required for "piecemeal" assemblies.

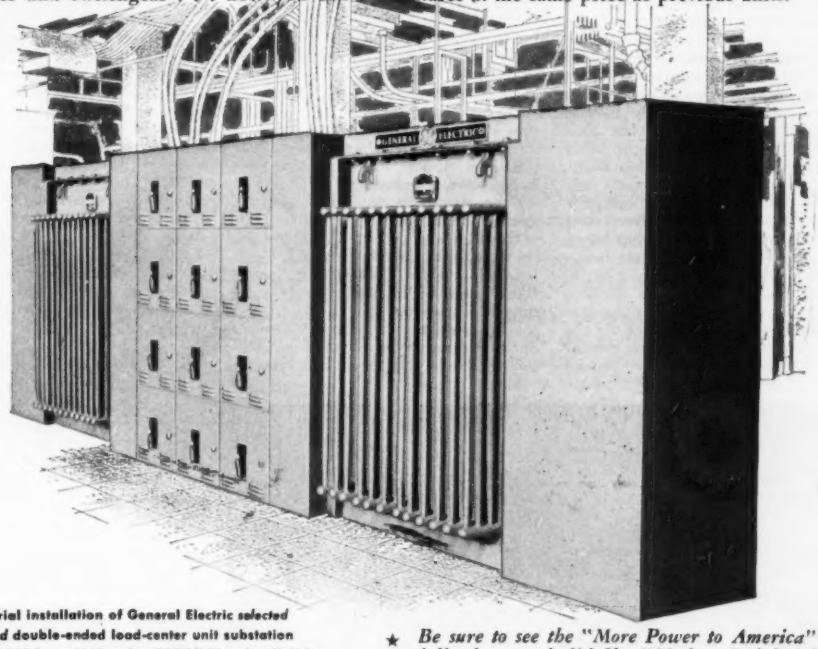
Ask your G-E sales representative *today* about how *selected standard* load centers can save time and money in *your* plant. Also, write for Bulletins GEA-3592 and GEA-3758. *Apparatus Department, General Electric Co., Schenectady 5, New York.*

substations give you...

Improved appearance

at no extra cost!

Note the smooth, integrated appearance of these new General Electric Pyranol* unit substations . . . no more gawky, "old-type" stovepipe connections between transformer and switchgear . . . now you can get the effortless flow of line and power that characterizes quality equipment for locations where appearance is a requisite. All these features at the same price as previous units.



Industrial installation of General Electric *selected standard* double-ended load-center unit substation rated 1500 kva, 4160 volts, 208Y/120 volts. Unit has oil cutout in incoming line sections, Pyranol-filled transformers, and the new AK-1 drawout air circuit breakers.

***Reg. U.S. Pat. Off.**

★ *Be sure to see the "More Power to America" full-color sound slidefilm "Modern Industrial Power Distribution." Ask your G-E sales representative to arrange a showing for your organization.*

GENERAL ELECTRIC

221-60

Plant Engineers' Digest

Simple Training Program Can Cut MH Costs

UNTRAINED industrial truck operators can bring about greater losses of time through accidents and disruption of production schedules than is generally realized. Such losses can be largely avoided by setting up a simple training program. Manufacturers of plant trucks have prepared excellent training programs for drivers, which are available upon request.

The best method of teaching a worker to properly operate industrial trucks is to give him plenty of actual practice. To provide this practice, many companies have set aside definite "training areas" in a corner of a yard or warehouse, or even in an alley. Dummy problems are set up which approximate typical materials-handling situations. New workers, if they have the aptitudes and attitudes necessary for truck drivers, quickly learn how to approach the load properly, pick it up, carry it, set it down and elevate it.

Training in maintenance also pays dividends. Many costly repairs, not to mention "down-time" losses, can be avoided by setting up a definite routine for maintenance which will help truck operators form the habit of taking as good care of their trucks as a first-class machinist does his tools.

Ten Good Rules for Driving Materials-Handling Trucks

1. Before starting work, inspect brakes, controls, guards, etc. Report need for repairs to your foreman.

2. Take a good look at your load before you pick it up. If it is not properly and safely loaded, don't move it; notify the foreman in charge.

3. Pick up every load squarely. Then there will be less danger of shifting, due to off-side loading.

4. Look before you start. Be sure there is no person or object in the path of your truck. *Always take a look before backing up.*

5. Carry your load as low as possible when moving. There is less danger of tipping a load kept at a low level.

6. If operating a truck with tilting device, *use it.* This improves the balance, and will avoid spilling the load while rounding corners.

7. Observe traffic rules. Keep to the right and obey "stop" and "slow" signals. They are placed in the plant for your protection and the protection of your fellow-workmen.

8. Blow your horn—but *NOT TOO MUCH.* Signal when approaching blind corners, swinging doors, etc. Several short blasts are better than one long blast. Blow horn and slow down when approaching pedestrians who are walking with back to your truck. *Remember: sounding your horn does not give you the right-of-way.*

9. Avoid making quick or jerky stops. The momentum of the load may play tricks on you. Have your truck under control at all times so that you can come to a gradual stop.

10. Never cut corners. You are in danger of having to stop quickly, losing the load, hurting someone, or damaging the materials being carried.

From Exide Topics, a publication of The Electric Storage Battery Co., Philadelphia 32, Pa.

Small Tube Cleaner Motors Solve Grinding Problem

THE BURR and grinder department of Elliott Company's Jeannette works has found an interesting solution to the problem of how to remove sand and burrs from hard-to-get-at places in castings. Furthermore, the solution turned out to be a company product.

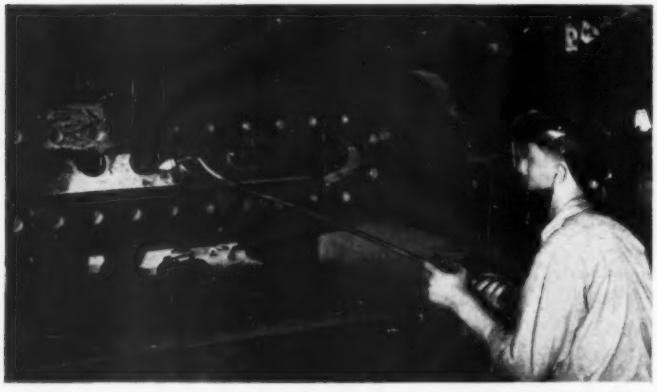
This department cleans up turbine castings (steam and exhaust ends, oil cylinders, and bearing pedestals), blower impellers, and strainer bodies. Several types of pneumatic and electric tools are used. However, there was no really satisfactory method of grinding small, out-of-the-way openings, or areas only to be reached through small openings. A bent file or a pickling process was being used to remove the sand or burrs, which were particularly objectionable in turbine castings where they might work into bearings and valves and thus cause serious damage to the equipment.

The solution turned out to be the use of the company's small tube cleaner motors. These little "600 Series" motors are screwed directly to lengths ¼-in. pipe which are bent even into acute angles so as to reach out-of-the-way places. A standard conical-shaped grinding stone screws directly onto the shaft of the motor (sometimes an adapter is used.) The operator controls the speed of the air-driven motor by means of a valve. Lubrication is by a sight-feed lubricator in the oil line.

To see inside surfaces, the operator uses three different sizes of dentist's mirrors before and after grinding.

Several dozen "600 Series" motors, in two sizes, both long and short bodied, fill the requirements of the burr and grinder department.

These little air-driven motors are also being supplied to other manufacturers for similar work. One manufacturer of Diesel engines, for instance, is using these machines to clean oil and water-cooling passages in castings. *From the Summer Issue of Powerfax, a publication of Elliott Company, Jeannette, Pa.*



This workman is cleaning up internal cored steam chest passages on a turbine steam end casing in the plant of Elliott Company, Jeannette, Pa.

Old Crow Fears Fires

A FIRE PROTECTION program at Old Crow Distillery goes far beyond the normal installation and maintenance of fire protection equipment and the organization and drilling of a plant fire brigade. The same program will also be initiated at Old Taylor Distillery in the near future.

There are 174 employees at Old Crow and 166 at Old Taylor and each of these employees must take an intensive course in fire protection and secure certification that the course has been successfully completed. The training course is conducted in classes of twelve. Each class is given 8 hr of instruction, two hours at a time, within two weeks.

Briefly, the course is outlined as follows: First Instruction Period—the hazards of fires, with demonstrations of their causes; the fire alarm system and signals; what to do first when a fire is discovered; the signal for fire drills. Second Instruction Period—the kinds of fires on which to use vapor-

THE GOOD RIGHT HAND OF INDUSTRY

Meet the Only

NEW Air Compressor Line *Since the War*

It's the Worthington Balanced Angle—the really modern-looking vertical air compressor that is as up-to-date *inside* as out!

See how this machine has been redesigned from the bottom up to give you everything we know you want in an air compressor—

You Get Smoother Performance because the V-type cylinder arrangement gives better running balance and faster cooling.

You Get Higher Efficiency because the isolated cylinders have 35% more heat radiating surface than in-line type; the aluminum heads release heat faster than cast-iron; and the high-speed fan throws 6 times as much air across the cylinders.

You Get Lower Maintenance because the valves are exclusive Worthington Feather* Valves; lubrication is controlled; bearings are famous Timken roller bearings, including oversize main bearings.

You Get Longer Life because the pistons in each stage, though different in size, *weigh alike*, reducing vibration; crankshaft is drop-forged steel with integral counterweights; bearing pressures and piston speed are low.

Your Worthington Air Compressor Distributor has a complete line of single and two-stage models, bare or tank-mounted, ½ to 15 hp.

PC.9.6

*Reg. U. S. Pat. Off.

WORTHINGTON

WORTHINGTON PUMP AND MACHINERY CORPORATION
PUMP AND COMPRESSOR MERCHANDISING DIVISION
HARRISON, NEW JERSEY

The Good Right Hand of Industry

POWER TRANSMISSION: sheaves, V-belts, variable speed drives
PUMPS: centrifugal, power, rotary, steam
AIR COMPRESSORS: water-cooled, air-cooled

MAIL COUPON FOR FREE BULLETIN

Worthington Pump and Machinery Corp.
Pump and Compressor Merchandising Div.
Harrison, N. J. Dept. PCT96

Send bulletin on Worthington Balanced Angle Air Compressor.

Name.....

Company.....

Address.....

Photo: Old Crow Distillery

Chief Guard John M. Phythian in the fire control instruction room at Old Crow. Corresponding in types and models to those located throughout the plant, the instruction room is equipped with a hand pump and stored air pressure vaporizing liquid, Pyrene foam, soda-acid, cartridge operated, and Co_2 extinguishers

izing liquid, carbon dioxide, foam, soda acid, water type and anti-freeze extinguishers; each member of the class must demonstrate his ability to use the extinguishers effectively in putting out various kinds of fires such as electrical, oil, gasoline, wood, rubbish. Third Instruction Period—the use of ladders and hose. Fourth Instruction Period—the use of fire cart equipment and ropes.

In order to still further cut down the ineffective and even dangerous use of the wrong type of extinguisher all extinguishers in the plant are located on distinctive red and white plywood panels. Lettering on the panels shows the type of fires for which the extinguisher should or should not be used. Extinguishers used in the classes are mounted on the same type of panels for the purpose of familiarizing employees with their purpose. *From No. 44 issue of Firefax, a publication of Pyrene Mfg. Co., Newark 8, N. J.*

Floor Waxes Aren't as Simple as One Might Think

WAXING FLOORS IS NOT NEW. In many old European palaces the parquetry floors have been waxed for centuries. They have survived heavy foot traffic all these years, in many instances outlasting heavier stone flooring.

Chemically, waxes are comparatively inert and to a great degree are water- and oxygen-resistant. These qualities give them their great protective value. Floor waxes in use today are blends of a number of highly complex substances, formulas being determined by chemical and physical properties of the components, together with the highly important matter of availability, for several of the best ingredients are extremely scarce and expensive.

Carnauba, for instance, is the most desirable wax for floors because it is hard and tough, possesses a high luster, and emulsifies readily. Availabiltiy, however, usually makes it expedient to blend this material with other substances to produce a commercially practical wax.

Nature has endowed a very small area in Brazil around the city of Fortaleza with a monopoly on carnauba. Although it has been possible to transplant the carnauba tree to similar climates elsewhere, nowhere but in the neighborhood of Fortazela will it produce wax.

The wax is exuded from the pores of the large palm-like leaf of the carnauba tree, its function being to protect the leaf against excess evaporation under the tropical sun, indicated by the fact that wax production is generally greater during dry years.

To recover the wax, the leaves are stripped from the trees, then taken to air-tight sheds where they are straightened, beaten and threshed. Afterward the floors, walls, and rafters are swept to recover all of the fine wax dust, which is melted, strained through cloth, and put into molds to harden.

One carnauba tree produces only about 2.8 oz. of wax a year. Although thousands of trees are cultivated in the Fortaleza area, it can be readily seen that this small production, plus the amount of labor required to prepare it for the market, unavoidably results in a high price. Principally for this reason, carnauba is usually blended with other waxes.

Candelilla is one common adulterant for carnauba. It is a hard wax with similar qualities, coating the stalks of two plants growing in the semi-arid regions of Texas and Mexico. It is extracted with petroleum ether, or by boiling the shrubs in water.

Other waxes frequently blended with carnauba and candelilla are: ouricury, obtained from the leaves of a Brazilian palm tree; cauassu, from another palm tree of Brazil; ozokerite, a mineral wax crushed from rocks found in Central Europe, Utah, and Argentina; paraffin, not a true wax but used in small quantities to increase plasticity; beeswax and spermacceti, used only in small amounts.

Floor waxes are of two general types: the so-called "self-polishing" water-emulsion waxes, and the solvent waxes, either liquid or paste. Water-emulsion waxes consist of a blend of waxes, distilled water with an added emulsifier; lac, gums, casein, or plastics, added to improve gloss; and small amounts of the new synthetic wetting agents, added to increase spreadability.

In solvent waxes, the wax is actually dissolved in a petroleum derivative such as naptha, Stoddard solvent, or turpentine.

In water-emulsion waxes the proportion is from 10 to 18 per cent wax; in liquid solvent types the proportion is 5 to 12 per cent; while the paste solvent types have the highest wax content of all, ranging from 20 to 40 per cent. *From an article by W. H. Miller in Proof, a publication of Joseph E. Seagram & Sons, Inc., Louisville, Ky.*

Make Sure Your Sprinkler System Will Really Sprinkle

FIRE-FIGHTING ability of sprinkler systems can be seriously impaired, if not entirely destroyed, by accumulated debris in pipes and fittings.

Pipe scale is naturally a common offender, occurring most frequently in dry-pipe systems, particularly where such a system has been maintained alternately wet and dry. Yet scale is not the only offender. An amazing variety of objects has been removed from sprinkler systems. Careless workmen have sealed up tools, blocks of wood, wiping rags, and various articles of clothing in piping systems. How some of the other objects got in remains a mystery.

The toll in fire loss can be heavy. A single piece of brick, lodged in a 3½-in. sprinkler fitting, once led to the destruction of an important plant building.

A test connection at the end of the sprinkler system, opened periodically, helps to indicate if pipes need flushing. Proper flushing procedure is as follows:

On cross-feed mains, first remove the flushing cap and inspect pipe visually. Then attach a hose to the pipe, terminating outside the building. A burlap bag tied over the end of the hose will trap material flushed from the pipe and indicate when it is clear. Branch lines

(Continued on page 48)

WICKWIRE ROPE

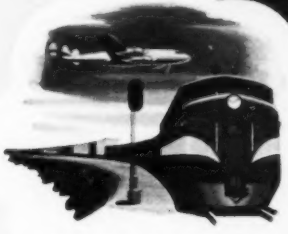
A PRODUCT OF CF&I

Ask any user . . . you'll find them everywhere

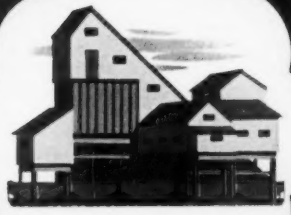
In scores of industries, users of Wickwire Rope have developed an affectionate respect for its performance, safety and long life. And, for true economy, they use Wickwire's WISSCOLAY® *Preformed*. It lasts longer — is easier to cut, splice and install. It's kink-resistant and safer to handle. Wickwire Distributors and Rope Engineers, in key cities everywhere, are prepared to render prompt service in meeting your wire rope needs. Wickwire Rope Sales Office and Plant — Palmer, Mass.

IN THE EAST—Wickwire Spencer Steel Div. of C. F. &I.
500 Fifth Ave., New York 18, N. Y.
IN THE ROCKIES—The Colorado Fuel and Iron Corp.
Continental Oil Bldg., Denver, Colo.
ON THE WEST COAST—The California Wire Cloth Corp.
1080—19th Ave., Oakland 6, Cal.

LOGGING

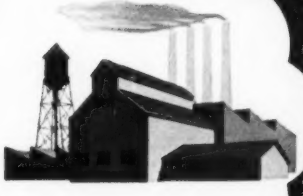


TRANSPORTATION

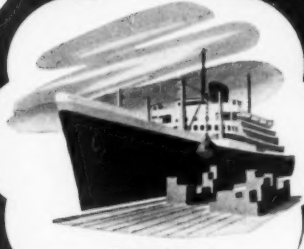


MINING

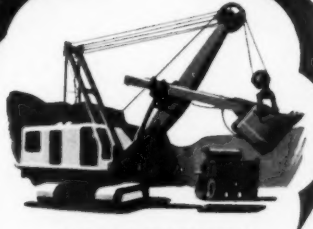
PETROLEUM



MANUFACTURING



MARINE



CONSTRUCTION

New Products and Methods

WHAT'S NEW? On these pages the Editors summarize the outstanding industrial developments of leading manufacturers who will supply you, free of charge, the bulletins or other information desired. For ease in making requests use the no-obligation, postage-paid card, pages 21 and 63

1—ULTRASONIC GENERATOR

Is developed for studying the effect of ultrasonic energy

This generator converts high-frequency electrical power into high-frequency mechanical vibrations in the form of sound waves pitched considerably higher than the range of human hearing. It permits a wide range by providing four vibration frequencies: 300, 500, 750, and 1000 kc.

Many possible applications in ultrasonic research are offered. Biologically, experimentation can be done on bacteria. Physically, the transforming of immescible liquids into stable emulsions and the colloidal suspension of precipitates in liquids can be examined. Investigation into chemical reactions such as oxidation, hydrolysis, and reduction is possible.

Self-contained in a steel console, the equipment consists of a power unit and transducer assembly. Simple controls mounted on the front panel include on-off switches for the high voltage circuit and the filament circuit, a voltage control to vary the power, and an instrument to indicate power supplied to quartz crystal.

The transducer assembly, mounted on top of the cabinet, consists of a transparent cylinder to hold insulating oil around the high voltage leads coming from the electronic circuit to the crystal. The transducer, or crystal, forms the bottom of a test well immersed in the insulating oil. Material to be tested is placed in a suitable container within this well and is directly exposed to vibrations from the crystal.

Standing 45-in. high, the generator is 21 in. wide and 19 in. deep. The test well is $1^3/_4$ in. dia. and $2^5/_8$ in. deep. Power input is 500 w at 115 v, 50 cycles, while power output is 200-250 acoustical watts. Special Products Div., General Electric Co.

2—SPEED LIMITING DEVICE

For use with motors, generators and motor generator sets

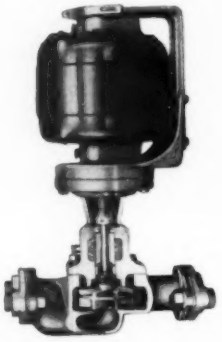
Adaptable to an extended speed range 100 to 2000 rpm, these limiting devices have weight and tension spring combinations to suit speed ranges within the overall range. Their improved design is said to result in an accuracy of approximately ± 2 per cent for higher speeds and ± 5 per cent for lower speeds.

Suitable for horizontal or vertical operation. Its rotating element is balanced about the axis of rotation to assure freedom from vibration and a trip arm guard is provided to prevent accidental actuation of the tripping mechanism. While each speed limiting device is set at the factory for operation at about 15 per cent overspeed for rated speeds up to 500 rpm and 10 per cent overspeed for higher rated speeds, adjustments can be made at the plant. Allis-Cnalmers Mfg. Co.

3—CIRCULATOR

Horizontal type, for use in radiant heating systems

The "HC" is described as a low cost and well constructed horizontal circulator. Outstanding features include porous bronze oilite bearing, rotary seals, spring drive coupling, stainless steel shaft, balanced cast bronze impeller, two bolt flanges



G. E. motor, interchangeable flanges, body rotatable for different pumping positions, quiet operation, and easy accessibility.

Sizes: 1, $1^1/_4$ and $1^1/_2$ in. (1-in. size is available with $^3/_4$ in. flanges). Capacities range from 7.5 ft head for all sizes at 0 to 42 gpm at 0 head for the 1 in. size; 43 gpm at 0 head for the $1^1/_4$, and 44 gpm at 0 head for the $1^1/_2$ in. Taco Heaters, Inc.

4—PLASTIC SPONGES

Are made for rough usage, but they're economically priced

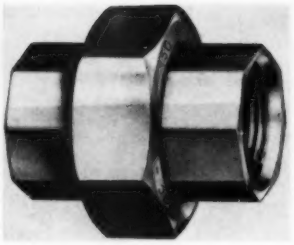
Described as the first on the market, these plastic sponges are said to be resistant to mild acids, alkalis, soaps, washing compounds. They can be boiled or sterilized, are soft when wet, wring out like a rag, and wipe dry like a chamois, according to manufacturer, who adds that these sponges are white and remain white.

Individually wrapped in cellophane bags, the two sizes available are approximately $6^1/_2$ by 4 by $2^1/_2$ in., priced at $1.75, and 6 by $3^3/_4$ by 2 in., at $1.25. Barco Chemical Products Co.

5—STEEL UNION

For 150-lb service, has ends of steel pipe coupling stock

Sturdiness, high corrosion resistance, attractive appearance and convenience in installation are features claimed for the

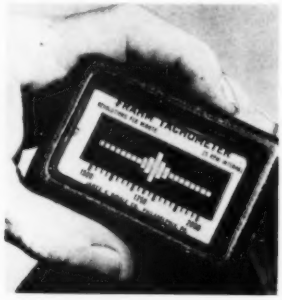


Pic R steel union for low-pressure service. Its ends are polygonal shaped to permit the use of open-ended wrenches in close-quarter installations. All steel surfaces are zinc-plated, even under the wedge-type bronze seat and on threads to provide rust and corrosion protection. E. M. Dart Mfg. Co.

6—MINIATURE TACHOMETER

For making speed checks quickly by touch or permanent mounting

This low cost, Frahm Resonant Reed Tachometer requires no contact with rotating element and imposes no load on the machine under test, manufacturer



states, adding that and it cannot be injured by overspeeding and requires no maintenance. It measures rpm and vpm and is available in ranges between 1000 and 13,000 rpm. Cases are available to accommodate one or three instruments; 60 and 90 deg brackets for mounting are also available. James G. Biddle Co.

7—THAWING POWDER

For melting ice and snow on steps, drives, walks, loading platforms

The thawing capacity of 1 lb of Ice Rem (Ice Remedy) is claimed to be approximately equivalent to 10 lb of salt. An exothermic chemical powder, Ice Rem is applied by sprinkling liberally over the surface, the amount used being dependent upon ice or snow thickness. Manufacturer states that there is no messy residue, and if used during the beginning of a snow or sleet storm, Ice Rem will melt subsequent light snow falls, keeping protected area continuously clean.

It is also recommended for use by truck drivers, as a handful thrown under each rear wheel is said to provide traction and stop wheel spinning. The powder is also described as suitable for thawing frozen gutters, pipes, sewers, railway switches. Comes in $9^1/_2$ lb cartons, $24^1/_2$ lb fiber pails and 90 lb fiber drums. Speco, Inc.

8—DIEHEAD

Is quick opening, for use with all electric power drives

The No. 77, is equipped with high-speed steel dies, which company officials believe, are especially suited to high-speed cutting. It features a self-centering chuck designed

(Continued on page 50)

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Bulletins on Current Plant Problems

ELECTRICAL

101 Enclosed Safety Switches — Four-pp Bulletin TEC 3024, giving factual information on heavy-duty industrial safety switches, describes them as able to withstand years of rough usage. Contains information about the applications these switches were designed for, extent of the line, available hp ratings. Includes illustrations of various product parts and explanation of benefits to be derived; also ordering information. The Trumbull Electric Mfg. Co.

102 Push Button Control—Electric centers providing push button control and automatic protection for electric circuits are presented in Bulletin 463-1, 24 pp. Explains manufacturer's "Pushmatic" center and its operation, illustrating and describing its simplicity of design and interchangeability of units. Covers in detail several types of electric centers using these units, giving engineering data specifications, ordering information and prices. Includes discussion of tripping characteristics of the units and effects of ambient temperature. BullDog Electric Products Co.

103 Electroplating Rectifier—A new selenium electro-plating rectifier is introduced in 2-pp Bulletin 248. Illustrated with photos, it discusses briefly the rectifier's electrical and mechanical characteristics, types of control and component parts. The Electric Products Co.

104 Photoelectric Cells — Technical Bulletin PC-848, 4 pp, on manufacturer's line of selenium self-generating photoelectric cells, contains diagrams and curves illustrating the construction, performance characteristics and applications of the photocells. Curves showing the cells' current sensitivity, voltage output, internal resistance, spectral sensitivity are also featured. A price list indicating company's standard sizes and discount schedule is also included. International Rectifier Corp.

105 Replacement Unit—A unit specially adapted for replacing obsolete oil current breakers of insufficient interrupting capacity in older distribution substations is presented in 4-pp Bulletin 18B7094 as a means of modernizing existing stations to handle increased generating capacity and meet faster relaying requirements. Contains complete dimensions and ratings of ratings of the unit, together with a description of a typical installation. Also included are photos of the unit and drawings to show principle of contact separation. Allis-Chalmers Mfg. Co.

106 Flexible Cord—The greater strength, impact resistance, flexibility and other advantages of "Dynaprene" neoprene-jacketed cord are explained and pictured in this 4-pp folder. Also illustrates and describes construction characteristics of the cord, including specifications and ordering data. The Whitney Blake Co.

107 Unit Cooled Motors — Constant or adjustable speed d-c motors of 15 to 200 hp for use in dusty, dirty, or oil laden atmospheres are featured in 4-pp illustrated Bulletin GEA-4469A. Discusses design features of construction which afford ventilation independent of motor speed, and promote savings in time and maintenance. Pictures both a single and double blower model. Gives operating characteristics. Apparatus Dept., General Electric Co.

108 Time Current Data—An "all-in-one" package of time-current information and engineering notes, this data is visibly filed in separate indexed folders for each fuse line. Curves are printed with colored inks on transparent paper. Includes total clearing time, minimum melting time and short time rating curves drawn on fine scale NEMA grids; designation of fusible element construction used in each fuse or fuse refill unit and effect of construction upon accuracy and "non-damageability" of element; rebuttal of arguments that short-time curves or "set back" allowances are essential in coordination of all fuses; variations in melting time characteristics caused by "pre-loading" and ambient temperature changes; also added speeds, standard, slow, and time-lag characteristics with average speed ratios. An excellent—and costly—compilation of technical information, this book is free to qualified engineers. S & C Electric Co.

109 Battery Charger — A four-circuit motor generator battery charger for motorized hand lift trucks is the subject of Bulletin 235, 4 pp. Photos show complete assembly and main parts and text emphasizes automatic operation of charger and its advantages of long service, minimum maintenance and ease of operation. Dimensional data, capacities given for two lead-acid battery chargers of this type and two Edison battery chargers. The Electric Products Co.

MATERIALS HANDLING, CONVEYING

110 Engineered Storage Equipment — Folder J 213 presents information on rotating storage bins and steel shelving as a means of solving industrial storage problems. Emphasizes merits of the circular bins for use in waste space and for handling small parts. The Frick-Gallagher Mfg. Co.

111 Belt Conveyors — "Move More for Less" is the title of 32-pp Bulletin 1400 presenting information on stationary, portable and special purpose belt conveyors, both troughed and flat belt. Included are future applications and methods of selection of belt conveyors; dimensions, weights and specifications for standard head, tail and intermediate sections; lattice, channel and timber frames; and terminal machinery. Lippmann Engineering Works.

112 Cable Conveyors—This 4-pp bulletin describes and illustrates a tubular cable conveyor developed for the food and chemical industries and capable of handling any flowable material. Standard assembly is illustrated by photo and drawing. Includes explanation of how the conveyor operates, a list of its advantages, dimensional data and capacity charts. Hapman Conveyors, Inc.

113 Engineering Data — **Conveyors** — ID-481 is a data book containing 96 pp of helpful material on manufacturer's belt conveyors and related equipment. Covers many types of idlers, flat rolls, trippers, brushes, scrapers, brakes, take-ups, pillow blocks, pulleys and feeders. Provides complete dimensional data, weights and prices, application recommendations and installation tips. Includes many pages of tables, charts, and horsepower formulae, as well as 10 typical belt conveyor diagrams. Industrial Div., Continental Gin Co.

114 Conveyor Systems—Catalog 248 contains 32 pp of photographs showing actual installations of conveyor systems in many industries. These include roller, wheel, belt, live roller, chain, and overhead trolley conveyors, elevating conveyors, sheet metal and roller spirals, ball transfers and special conveying equipment. Brief text matter touches upon available designs and sizes and recommended applications for each class of equipment shown. Mathews Conveyer Co.

115 Pipe Conveyors—Catalog 5000, 48 pp, covers manufacturer's sealed pin-rubber flight conveyors and accessories. Includes engineering drawings of typical systems for fluor, dust, coal, sand, flux, lead, powders, chips, spent grains and sludge handling. Contains pictures and sketches of typical conveyors, drives, vibrators, sludge tanks, trenches, "Pneumatrols" and sealed pin chains, plus capacity charts. Hapman Conveyors, Inc.

116 Industrial Jacks—Bulletin 49 is a 4-pp ordering catalog covering single acting rachet lowering jacks, track jacks, screw jacks, hydraulic jacks, push and pull jacks, reel jacks and related equipment and accessories. Gives sizes, capacities, weights and prices; tells applications. Templeton, Kenly & Co.

117 Power Wheelbarrow—Bulletin KM280, 4 pp, is filled with pictures of a 1200-lb (or 10 cu ft) capacity power wheelbarrow with optional platform body. Illustrations show it performing pushing, pulling and dumping operations. Also included are a large photo showing how the wheelbarrow is built, dimensional sketches, specifications. Kwik-Mix Co.

WIRE ROPE, CHAINS, AND ACCESSORIES

118 Wire Engineering Handbook—This is an excellent handbook containing 150-pp of information and engineering data on wire rope. Among subjects covered are wire rope construction, types for various jobs, handling, damaging, groove contour and sizes of sheaves, bending stresses, winding, and fleet angle. Chapters on elevator and shaft hoist ropes cover estimating of strength, safety factors, and lubrication. Book is generously illustrated with photos and drawings. Should be a worthwhile addition to plant engineer's working library. John A. Roebling's Sons Co.

119 Wire Rope Slings—Heavy-duty slings built for tough jobs are the subject of this 8-pp ordering catalog. Illustrates by photo and drawing the types of slings offered, giving their dimensions, safe loads, recommended applications. Emphasizes construction features which contribute to increased strength. Lists angles at which

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Bulletins on Current Plant Problems

various types of hitches operate efficiently. Includes several photos of slings in use. Union Wire Rope Corp.

120 Blocks and Sheaves—Catalog 300-6A, 20 pp, is an ordering book for wire rope handling equipment — blocks, hooks, sheaves, winches, clips, and special fittings. All equipment is illustrated by photo. Includes specifications, dimensional data. American Hoist and Derrick Co.

121 Wire Rope Clips—In 12 pp pocket-size Catalog 900-42 covers a line of fastening clips for use on wire rope, giving specifications and available sizes. Explains merits of these clips and includes instructions on how to use them to best advantage, picturing some actual installations. Also lists filler blocks. American Hoist and Derrick Co.

122 Alloy Steel Chain—This is a 12-pp bulletin covering alloy steel chain for slings. Besides giving general specifications and working load limits on this chain, it illustrates and provides specifications for various types of single, double, triple, and quad branch slings, also sling, foundry and grab hooks, and magnet chains. Discusses properties of the alloy used in these slings, defines terminology used, and gives tips on the purchase and use of chain. Includes photos of the chain, also several steps in its manufacture. S. G. Taylor Chain Co.

MAINTENANCE

123 Maintenance Paint—This 6-pp folder describes the advantages of maintenance paints based on "Parlon," manufacturer's chlorinated rubber—paints which can be formulated for concrete or metal surfaces. Bulletin stresses their immunity or near immunity to almost all agents which commonly destroy conventional paints by chemical action. Also lists suggested applications for these paints, and tells how they are applied. Cellulose Products Dept., Hercules Powder Co.

124 Grease Absorber—An absorbent preparation developed to keep oily and greasy floors dry and afford increased protection against accidental slipping and fire hazard is featured in 4-pp Bulletin 505 473. Describes and illustrates many industrial applications for this product, telling how it is used. Trojan Products Dept., The Diversey Corp.

125 Scaffolding—Bulletin PS812 contains 8 pp of photos of scaffolds made of prefabricated sectional units for exterior, interior and special uses. These pictures show scaffolding in use, as well as available units, including bases, extension legs, end frames, rails, braces, casters, ladders, trestles and other parts. Gives sizes, code numbers. The Steel Scaffolding Co., Inc.

VALVES AND ACCESSORIES

126 Valve Parts—Diagrammatic sketches of gate, globe, check and lever operated valves are presented along with a uniform material and parts identification code in this 4-pp bulletin titled, "Names of Valve Parts." A valuable addition to a plant engineer's file, this is said to be the first publication of its type to follow the newly proposed standard designations of the Manufacturers' Standardization Committee. The Cooper Alloy Foundry Co.

127 Flushing System—Designed principally for operation of manufacturer's flush valves, the automatic electrically-operated flushing system described in this 4-pp bulletin is adaptable to old as well as new installations. Bulletin emphasizes the efficiency, economy and simplicity of the system and lists other advantages. Illustrates and explains the operation of the day-night timer designed to provide for flushing at close intervals during the day and hourly intervals at night. Includes wiring diagram. Also describes a 5-min timer for use on small installations. Sloan Valve Co.

128 Safety Heads—Bulletin A-47 is an 8-pp booklet covering safety heads, safety head flanges, safety head rupture discs and relief valves, automatic chemical feeders and pressure vacuum vent valves. Twenty-seven photos and drawings illustrate products and fittings. Charts give capacities, ratings and specifications. Black, Sivalls and Bryson, Inc.

RUBBER, RUBBER PRODUCTS

129 Rugged Rubber — Catalog Section 9010, 4 pp, outlines the recommended uses for various grades of Armorite, described as the toughest abrasive-resistant rubber known. The material is used to line chutes, pipes, sandblast cabinets and, according to catalog, has great resistance to cutting action. Describes construction of several types of this material, giving specifications and data. The B. F. Goodrich Co.

130 Rubber Resurfacing—"How to Resurface and Repair Lined and Hard Rubber Equipment," is the title of 4-pp Bulletin C-3, which tells how to analyze a repair job, suggests materials to be used and explains how to use them. Instructions cover preparation of the surface, mixing the cement and applying it. Common corrosives to which manufacturer's products are resistant are listed, and applications for five of these cements are discussed. Carboline Co.

131 Products for Petroleum Industry—Booklet 6902, 16-pp describes rubber and asbestos products for the petroleum industry, covering equipment used in oil production, refining, transporting and maintenance. Contains descriptions of new products and information on rotary and other hose, belts, brake blocks, packings and gaskets. Photos show equipment, many installations. Manhattan Rubber Div., Raybestos-Manhattan, Inc.

132 Sand and Cement Hose—Describing the construction by cutaway illustrations and text, Catalog Section 4400, 2 pp, covers hose for handling sand and cement. Includes sand discharge and placement hose, cement handling hose, and grout hose. Specifications and data are given in tables for each type. The B. F. Goodrich Co.

INSTRUMENTS AND CONTROLS

133 Industrial Thermometers—Four-pp Form 6143 contains descriptions, specifications and standard chart ranges for five different types of thermometers as well as for bulbs and fittings. Included are recording thermometers, both stationary and portable types with 24-hr and 7-day clock movements; dial indicating thermometers with solid liquid filled and vapor tension actuated movements suitable for refrigeration, food processing and other uses, and several types of indicating thermometers for food freezer units. The Electric Auto-Lite Co.

134 Electronics at Work—Applications of electronic equipment which produce a better job at less cost and greater profits are described and illustrated in this 20-pp booklet. It covers 15 types of this equipment and illustrates how many industries are using sound systems, projectors, intercom systems, test and measuring equipment, rf heating equipment, electronic sealers and the electron microscope. Lists more than 40 complete lines of electronic products and services. RCA Victor Div., Radio Corp. of America.

135 Helicoid Pressure Gages—Sixteen-pp Catalog DH-S18 explains in detail how manufacturer's helicoid gage operates and at the same time familiarizes users with the various parts, including the helicoid movement. Parts are easily identified by large cutaway illustrations. Also included is complete information on the Bourdon tubes used, the external point adjuster, standard gage accessories, case designs, dimensions and shipping weights. Prices given for accessories. Helicoid Gage Div., American Chain & Cable Co., Inc.

136 Pressure Regulators—Catalog S, 32 pp covers manufacturer's complete line of regulators, including regulators for welding, cutting, special flame processes, for maintaining gaseous pressures in electrical equipment and other operations where controlled gas pressure is required. Illustrates 26 regulators and describes over 100. There is also a section on regulator adapters and pressure gages, as well as several pages devoted to flow and pressure charts. A 4-pp price list is included with catalog. Air Reduction Sales Co.

137 Gage Testers—This 4-pp brochure describes and illustrates a dead weight gage tester, giving construction details and operating instructions for a high pressure, low pressure and double range model. Table shows standard weight groups furnished with these testers. Star Brass Mfg. Co. Div., Williams & Russey Machine Co., Inc.

138 Alarm Silencer — One-pp Bulletin 7400 completely illustrates and describes briefly an automatic alarm silencer, telling some of its applications. It also provides an explanation of its operation, and includes an easily-followed wiring diagram. Automatic Control Co.

139 Flow Meters—The high accuracy, safety, flexibility, low maintenance, and other features emphasized for manufacturer's "Magna-Clutch" mechanical flow meters are explained in 8-pp Bulletin 42-915. Illustrated with photos and operational drawings, it also contains dimensional and meter piping sketches as well as engineering specifications. The Hays Corp.

140 Industrial Instruments—Catalog 15, 40 pp, is a complete guide for selecting in-

(Continued on page 63)

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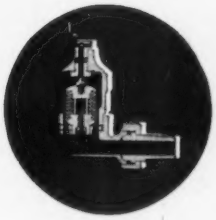
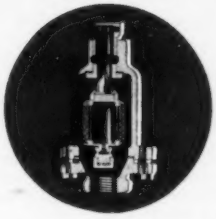
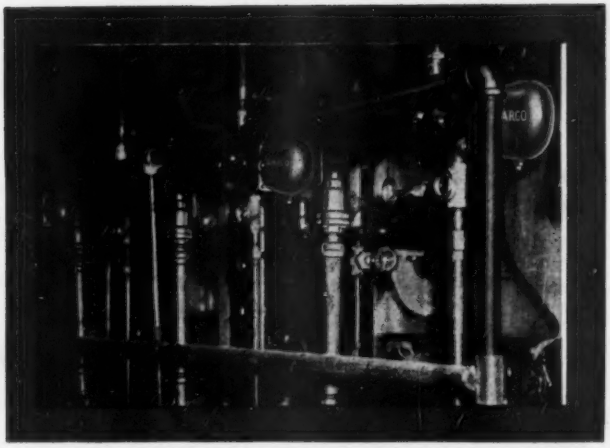
THE *Why* AND *How* OF AIR VENTING







Trapping and venting rotating cylinders of slasher in textile mill

Every steam man knows that air blocks steam lines, but too many executives do not realize what air in the lines and equipment is costing them, and how inexpensive the devices are that can remove it.

There are two vital reasons why air should be removed at the point where it collects.

First—an air steam mixture always has a lower temperature than pure steam at the same pressure. Steam temperature at 15 psi is 249°F, but mixing 50% of air would reduce this to 212°F, equivalent to 0 psi pressure.

Second; and more serious, the air collects on the heated surface and insulates it from the hot steam, reducing output.

THE SOLUTION

First, select the right steam trap. The Sarco No. 9 Thermostatic for instance is wide open when cold. It lets all the initial air out fast. Other Sarcos let air out too, but only at the point where they are installed.

So the next step is to put in Sarco Air Vents at suitable spots in the lines—at the farthest point from entry of steam in process equipment—and at many points in your heating lines.

This is a subject of renewed interest because Sarco has recently designed a complete line of vents and made available special technical data on the subject.

ASK FOR CATALOG No. 275

269

SARCO COMPANY, INC.

Represented in Principal Cities

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SARCO CANADA, LTD., TORONTO 5, ONTARIO

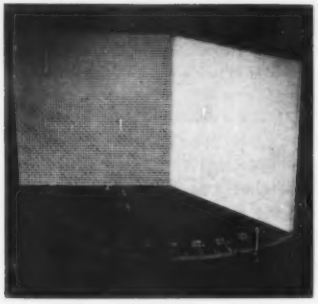
SARCO SAVES STEAM

IMPROVES PRODUCT QUALITY AND OUTPUT

Louvers "Frozen" in Glass Aid Plant Lighting

Contributed by Corning Glass Works

AN IMPORTANT advantage in cleaning and maintenance of lighting equipment — tubes, reflectors, luminaires—is gained with this photosensitive glass. It presents the advantages of "egg-crate lighting without the egg crate." Accumulations of dust and dirt on tubes and reflectors is done away with, to a great degree, and shallower lighting fixtures are made possible.

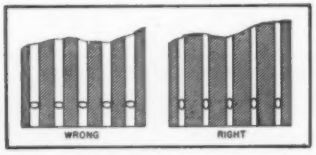


These two demonstration panes effectively tell the story of the material's ability to cut off glare at an angle

Punch Holes Right Or Belt Loses Strength

Contributed by W. F. Schaphorst

WHEN PREPARING a belt for lacing, oblong holes are preferable to round holes but the long axis should lie parallel with the length of the belt. The shaded areas in the accompanying sketch indicate how the strength of the belt can be affected. The sketch on the left has a much smaller shaded area and consequently less strength than the belt on the right. Exaggerate this condition sufficiently and the belt would have no shaded area and, consequently, would be cut in two.



With the ellipse running across the belt the hole has reduced the strength of the belt by as much as 50 per cent. This can be cut down by running the ellipse in the direction shown at the right

How To Eliminate Two Crane Hazards

Contributed by E. C. Walsh, Century Indemnity Co.

OVERHEAD CRANES are the work horses of the average plant or shop. The ease with which these cranes do their work should never lull an operator into complacency. Cranes should not be asked to lift more than their capacity rating and operators should always be instructed in crane construction and inspection as well as operating technique so that the crane operations will always be safe as well as efficient.

In the case of small cranes, overloading and rough handling can be instrumental in causing accidents. The floor operator working along side of the load or directly under the crane is particularly vulnerable. He is concerned with the path along which the load is moving and consequently if anything happened, such as the shearing of a spindle allowing the crane to fall, the operator would not have a chance to get away. This hazard can be minimized greatly by the installation of Z bars as shown in Fig. 1. These bars, as noted, are installed on both sides of the crane in such a manner that the top of the Z bar rides just over the lower web of the I beam. The bars are attached to the crane by bolts. If the crane falls the Z bars will hold the unit. If the crane is too heavily loaded and the stress on the Z-bar bolts too great, the delay will be sufficient to allow the operator to escape from under the unit. The noise caused at the first break of the crane, the sudden dip or sway of the load would be the warning symptoms trained operators would recognize as danger signals.

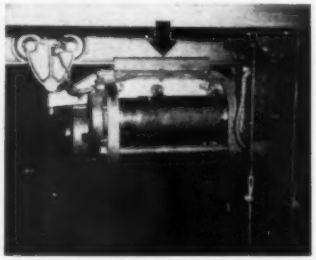


Fig. 1. The Z-bars (arrow) are designed to hold the crane and the load for a brief period to allow the operator to escape from under the crane should a spindle break

On some cranes, operating on a single overhead track and having one way motion, Z bars cannot be used to the best advantage. The crane in mind, as noted in the sketch, is constructed in two units, one unit containing the traction wheels and the second unit containing cables, drum, motor, etc. These two units are joined by a single 2-in. pin of steel construction.

Usually, because of camouflage metal, the 2-in. pin cannot be seen from the floor level and the crane looks more powerful than it really is. The untrained operator by overloading and abusing the crane can weaken the pin. This is especially true where the crane is used to move loads that are not directly under the track. Side strain put on the pin by pulling or jerking will weaken the pin and if it does snap, there is nothing to prevent the load and the crane from crashing to the floor with such speed that the operator would not have a chance to move. Cable slings, as shown in the sketch, will provide adequate safety by preventing the crane from falling in the case of pin breakage.

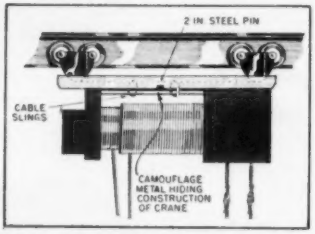


Fig. 2. Two cable slings around the upper and lower parts of this hoist will perform the same function as the Z-bars

Burns Asphalt Fumes; Ends Nuisance Odors

Contributed by Manufacturers Light & Heat Co.

A PUBLIC relations job was necessary at the Chester, W. Va. plant of T. K. Roofing Co. when the City Councils of two towns met to demand something be done about the objectionable asphalt odors emanating from the processes.

The Manufacturers Light & Heat Co. sent its engineers and, after a great deal of study and accumulation of data on fumes, volumes, speed of flame propagation, inflammable limits and other subjects the final solution was as shown in the accompanying photo. They burn the fumes!

The Fume Incinerator consists of

D-C Power Costs Cut 20% Yearly!

Mr. R. H. Hill, chief electrical engineer at U. S. Arsenal, Watervliet, N. Y., makes a periodical inspection of G-E mercury-arc rectifier.

G-E rectifiers cut Arsenal's yearly maintenance and operating costs $3500

Mr. R. H. Hill, at the U. S. Government Arsenal, Watervliet, N. Y. is just one of the many forward-looking plant engineers who is cutting his plant's power bill with the new, modern way to get d-c power—by installing mercury-arc power rectifiers.

You can install these units, and then practically forget them. This means big savings in both maintenance and operating costs.

Mr. Hill, for example, says that installing a G-E 400-kw rectifier at the arsenal in 1943 reduced maintenance expense $500 a year. At the same time he reduced operating expense about $3000 a year, because he was able to transfer to other work the operators formerly needed. Total savings of $3500 represent a 20% cut in yearly d-c power costs.

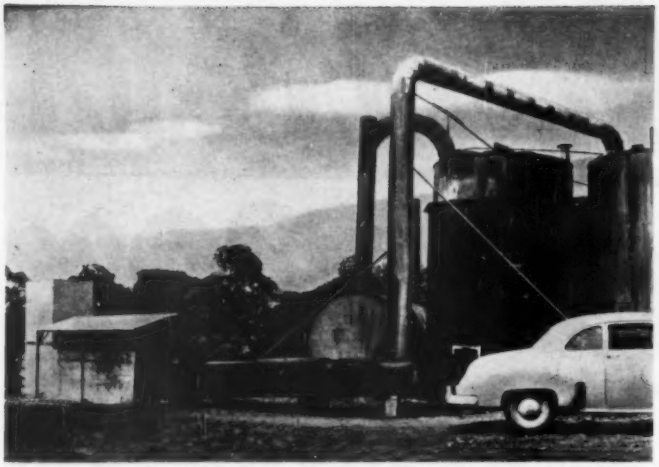
TO CUT YOUR POWER COSTS

Find out today how you can cut your power bills by putting G-E mercury-arc power rectifiers to work in your plant. Call or write your nearest G-E sales office for information. *Apparatus Department, General Electric Company, Schenectady, N. Y.*

P.S.—G.E.'s MORE POWER TO AMERICA program on Industrial Power Distribution—slidefilm and technical manual—presents the advantages of LOAD-CENTER SYSTEMS: low cost, flexibility, ease of expansion, good voltage, safety. Ask your electric utility or G-E representative to show you the program soon.

G-E Mercury-arc Rectifiers Mean Low-cost D-c Power

GENERAL ELECTRIC



At the right are the two oxidizing tanks; the 18 in. steel stack in the foreground connects one tank with the manifold of the fume incinerator. The other tank was subsequently connected in a similar manner to eliminate the settling tank in the center background. The 2 by 2 ft steel manifold parallels the ground to the left of the picture where it enters the incinerator oven. The sheet metal covering keeps rain from striking the heated fire bricks

an 18 in. steel stack from the discharge outlet on top of the oxidizing tank. It curves over and down to ground level where it enters into a steel manifold.

At the point of entry into the manifold the stack was provided with an adjustable blast type gate in order to be able to control the pressure and velocities of the fumes. This precaution was necessary in order to insure against possible backflashing into the oxidizing tank.

The 2 ft by 2 ft manifold, constructed of heavy steel welded sheets, was designed with two explosion caps. One is on top and one is at the end near the stack. The manifold is 20 ft long with the last 6 ft being narrowed down to a 6 in. width and provided with an adjustable blast type gate. This gives an adjustable port area for the fumes much in the same manner as incorporated in all gas burners.

Thus, with pressure indicators on both the stack and the manifold, it was an easy matter to obtain pressures desired to be able to operate well within safe limits.

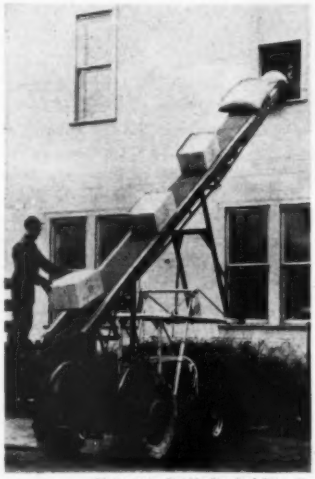
At the end where the adjustable port area was placed, the incinerator oven was built. This oven was constructed entirely of fire brick. It is 4 ft by 4 ft by 16 ft with a 12 ft stack of brick at the end. The inside section of the oven was built up with checker work to provide surfaces for fuel contact and ignition when heated to incandescence. It also caused a turbulence that would insure complete burning of all the fumes.

In addition to the fuel provided by the fumes, natural gas burners were installed to fire parallel to the flow of the fumes. These 4 in. inspirator type burners are to be used for preheating the oven up to the ignition point of the fuel in the fumes. The temperatures within the oven range upwards to 2400 F.

Second-Story Man Gets a Lift

Contributed by
B. F. Goodrich Co.

THERE ARE LOTS of places where a permanent conveyor installation is out of the question. Then, too, there are lots of places where *some* type of conveyor is absolutely necessary once in a while. The combination shown in the photograph is about ideal for this type of job. The tractor is for mobility and power, the conveyor for the materials handling and the belt to make sure the load gets where it's going. Special construction of the Griptop belt provides approximately 1000 fingers for each square foot of surface.



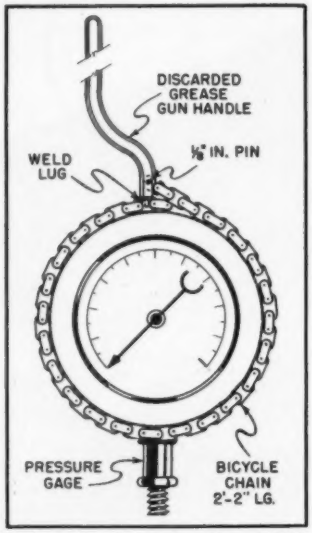
Photograph: Rapids-Standard Mfg. Co.

A Ford tractor, and a Rapids-Standard conveyor are doing a job of work with a belt from Goodrich. Griptop, that is

Wrench for Gauge Covers

Contributed by
George A. Larsen

ONE OF THE most difficult jobs to perform, and one which generally must be done by makeshift means, is the removal of tight fitting circular covers such as those encountered on pressure gauges. Many times an instrument mechanic does not have a strap or chain wrench handy but a very acceptable substitute can be made as shown in the sketch.



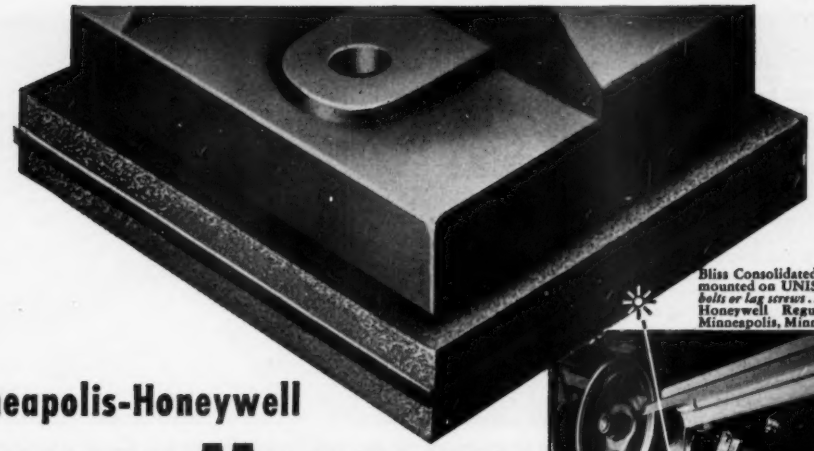
Various discarded parts make workable wrench

Practically the only parts needed are a discarded grease gun handle, or similar piece, and an old bicycle chain at least 2 ft 2 in. long. Construction and use of the tool are explained by the sketch.

Floor Skids Save Money

Contributed by
Geo. J. Newhams

TO PROVIDE a firm and accurately leveled foundation for assembly of steel sections of towboats, barges and other marine equipment, Dravo Corp., Pittsburgh, recently installed steel rail floor skids covering a total floor area of 7,992 sq ft in its structural shop. The increased efficiency resulting from the unique floor skids



Bliss Consolidated #8 Punch Press mounted on UNISORB . . . *without bolts or lag screws* . . . at Minneapolis-Honeywell Regulator Company, Minneapolis, Minnesota.

Minneapolis-Honeywell

MOUNTS MACHINERY ON UNISORB

. . . Drilling avoided . . . floors saved!

Here's why one of the biggest names in industry anchors practically every kind of machine on floors of every construction in the modern way . . . *on UNISORB!*

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Lowers machine and building maintenance costs.

Higher speed machine operation often possible.

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will amortize the cost of installing them in a little more than two years.

Standard 60 lb structural quality, steel rails were set in pairs on a concrete base and leveled to the elevation of the existing floor. Anchor bolts set in the concrete base held the rails securely to leveling shims while the space between the rails was filled with concrete to ¼ in. below the top of the rail.

The steel rail grids not only provide a firm foundation for the heavy structural work but also act as a tool for leveling and squaring sections under construction and holding them to prevent skewing or warping during welding.

Steel beams formerly used for this type of work had to be set, leveled and shimmed for each new job. The concrete-embedded rails eliminate the manhours required for that operation and, in addition, save time in the final assembly work in the shipyard because the sections are prefabricated more accurately.

Closeup of the double rail floor skid before concrete was poured. Pan welded to the end is for cleaning out refuse that collects between the two rails. Wood block fits into the clean-out pan when it is not in use.

Loading Time Halved By Electric Hoist

Contributed by Yale & Towne Mfg. Co.

THE TIME REQUIRED to handle outgoing shipments of finished goods was cut to one-half by the W. W. Sly Mfg. Co., Cleveland. It was accomplished by replacing a hand-operated hoist with an electric 10-t unit.

The company manufactures air conditioning and dust control equipment and outgoing cases weigh from 1 to 10 t. These cases are transported from storage zones to street-truck and rail-car and lowered into position by the hoist. As shown in the photograph, the hoist is trolley-mounted on an overhead I-beam. The I-beam is also trolley-mounted and travels the length of the shipping platform along an overhead structural steel runway. Thus, the hoist has two-way travel and can closely spot outgoing cases onto carriers. The hoist is mounted perpendicularly to the I-beam so that it can place or pick up material in close proximity to the supporting columns of the runway.

The tong used to pick up the containers automatically tightens the tong into the container and prevents it from falling. An extra long control cable permits the operator to raise or lower the hoist hook at a safe distance from the load.

The double trolley-mounting of the electric hoist and the I-beam on which it travels permits the hoist to cover the entire length of the shipping dock

Asphalt Tile Floor Care

Contributed by Asphalt Tile Institute

THE FINEST floor ever installed becomes shabby and may be damaged beyond repair unless properly cared for. Conversely, correct cleaning methods and protection of the floor surface from damage by heavy objects will bring years of satisfactory service as the floor retains its original beauty.

After a new asphalt tile floor is fully set it should be thoroughly cleaned with a warm neutral soap solution, rinsed with clear water and the surface dried with a clean mop.

Several successive light coats of a good grade of water-emulsion wax should then be applied. This brings out the inherent beauty of the tile.

Thereafter, the floor is kept clean and attractive by daily sweeping and occasional washing with a warm neutral suds solution. All traces of soap and dirty water should be removed with a clean water rinse.

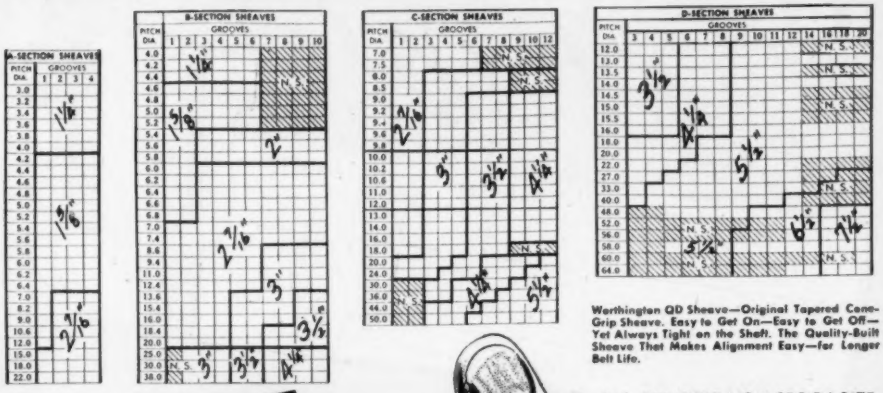
Strong detergents and cleaning compounds not readily soluble in water should be avoided, as should those containing kerosene, turpentine, oils, free fat, alkali or acids. These soften the tile, causing colors to bleed. Since grease and oils will permanently stain the floor, they should be wiped off immediately when spilled.

If ordinary washing fails to remove stains, the surface of the stained tile should be rubbed lightly with No. 00 steel wool dipped in a

(Continued on page 47)

THE GOOD RIGHT HAND OF INDUSTRY

STOCK SIZES WORTHINGTON HEAVY DUTY "QD" SHEAVES WITH MAXIMUM BORES INDICATED



Worthington QD Sheave—Original Tapered Cone-Grip Sheave. Easy to Get On—Easy to Get Off—Yet Always Tight on the Shaft. The Quality-Built Sheave That Makes Alignment Easy—for Longer Belt Life.

N.S. DENOTES NON-STOCK SIZE

to deliver your sheave immediately

As long as it takes our distributor's shipment to get there is as long as it takes—in most cases—to get exactly the sheave you need into your hands. Your Worthington distributor has practically any stock size you'd ever call for—if he hasn't, one of the Worthington warehouses will get it to him in 24 hours or less.

Check your sheave requirements. With more sheaves listed as "stock sizes" and more sizes in stock than any other distributor, your Worthington distributor may be able to save you the cost of a special sheave.

Top-ranking distributors in every industrial center handle Worthington QD Sheaves and Worthington-Goodyear V-belts. They are backed by Worthington warehouses whose stocks duplicate the factory stock at Buffalo—more sizes stocked than any other sheave on the market. With 853 sizes in "A", "B", "C" and "D" sections, ½ to 600 hp, you can fill almost any rpm requirement with a *stock* sheave. Also: 332 listed stock sizes of EC Cord V-belts.

So, when you need sheaves, call your local Worthington Multi-V-Drive distributor—his name is under Worthington in A-Z Section of THOMAS' REGISTER.

For Balanced Drive Performance

Specify Worthington Multi-V-Drives, with QD Sheaves and Worthington-Goodyear EC Cord V-belts. (Goodyear EC Cord or Steel Cable V-belts are used exclusively in Worthington Multi-V Drives.)

WORTHINGTON

WORTHINGTON PUMP AND MACHINERY CORPORATION
MULTI-V-DRIVE SALES DIVISION
Buffalo, New York—General Offices: Harrison, New Jersey

The Good Right Hand of Industry

POWER TRANSMISSION: sheaves, V-belts, variable speed drives
PUMPS: centrifugal, power, rotary, steam
AIR COMPRESSORS: water-cooled, air-cooled

MVD-2

SMALL STEAM LEAKS

Showing cost of various sized steam leaks at 100 pound pressure. (Assuming steam costs 50 cents per 1000 lbs.)

Size of Orifice	Lb. Steam Wasted Per Month	Total Cost Per Month	Total Cost Per Year
1/2"	835,000	$417.50	$5,010.00
3/8"	470,000	235.00	2,820.00
1/4"	210,000	105.00	1,260.00
1/8"	52,500	26.25	315.00
1/16"	13,200	6.60	79.20
1/32"	3,400	1.70	20.40

(For steam at 50 pounds pressure, the waste is about 75% of the above figures; at 20 pounds, it is about 50%; and at 5 pounds, the loss is about 25%.)

TYPICAL FUEL SAVINGS SECURED WITH ARMSTRONG TRAPS

20% FUEL SAVINGS after trapping all heating coils individually. — Norton Greenhouses, St. Paul, Minn.

$26,119.62 FUEL SAVINGS after installing new heating system and individually trapping all mains, risers, coils and unit heaters with Armstrongs.—L. G. Balfour Co., Attleboro, Mass.

SAVED—3,728 GALLONS OF FUEL OIL in one year after replacing old traps with Armstrongs on low pressure heating system and steam heated equipment.—Mary Lincoln Candies, Buffalo, N. Y.

STEAM SAVERS:

For trapping heating systems and process equipment from 1 to 250 psi, Armstrong Traps are available in side inlet—side outlet or bottom inlet—top outlet body styles. These compact, dependable traps provide more actual hot condensate capacity per dollar of trap investment than any other traps on the market. For selection data, capacities and prices SEND FOR the 36-page ARMSTRONG STEAM TRAP BOOK.

CHECK YOUR STEAM TRAPS *now!*

The chart above shows that a "little" steam leak can cost a lot—and a hundred or a thousand little leaks cost a lot more! No plant can afford the luxury of leaky steam traps. It costs far more to keep them than it does to replace them with modern Armstrong Inverted Bucket Steam Traps. Armstrong Traps won't leak steam because:

1. The valve and seat are ground and lapped to a precision, steam-tight fit.
2. The valve is water-sealed at all times.
3. Both the valve and seat are made of chrome steel, heat treated for long life and corrosion and erosion resistance.

With today's high fuel and operating costs Armstrong traps are priced lower in proportion to the savings they can effect than at any time in their history. Let your nearby Armstrong Representative help you select the traps you need or write direct to the factory.

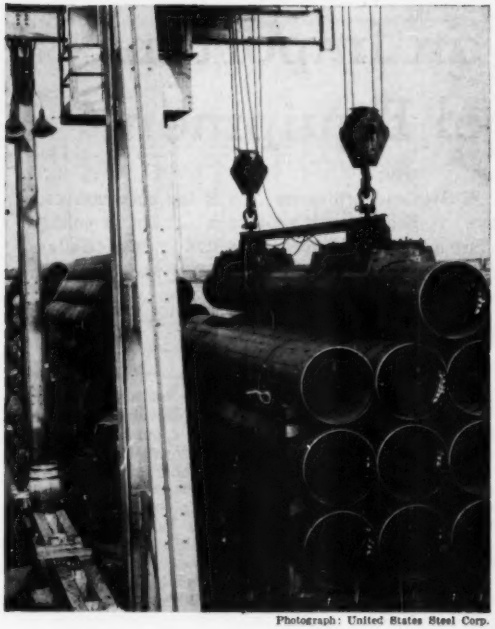
ARMSTRONG MACHINE WORKS
912 MAPLE ST., THREE RIVERS, MICH.

ARMSTRONG STEAM TRAPS

Factory Representatives in 48 Key Cities... Traps Stocked at 147 Points

Plan*gineering*

Planning, ingenuity and engineering are responsible for the successful completion of many projects. If you have done a job you're proud of send us a photograph and brief description. Every one accepted from a reader will be paid for. Photos also accepted from manufacturers



Photograph: United States Steel Corp.

● **Biggest Load on the Road**—A magnetic hoist is shown here loading the longest trainload of pipe ever hauled by the Santa Fe. Consigned to Transcontinental Pipe Line Corporation in Texas for construction of a line from Texas to New York, this shipment is the first of 20,000 carloads which will be needed to complete the project

Photograph: Texas Engineering & Mfg. Co.

● **Hose Pusher**—A. E. Smith, mechanic at Texas Engineering & Mfg. Co., Dallas, exhibits the "hose pusher" which he designed to aid him in pushing flexible hose over the bead on an aluminum tube. Much of Mr. Smith's work consists of installing de-icer "bugles" on C-54 transports and this work can't always be done by hand. It can pull a hose, too

● **Pipe Puller**—Diamond Alkali's brine line from plant to the wells 17 miles distant runs across swamps and beneath both a shallow lake and Houston Ship Channel. The 1500 ft length required to span the latter was first made up and tested on shore. Then, with cable inserted through it, as shown, the pipe was successfully pulled across and buried six feet deep in the bottom of the Houston Channel

Photograph: Diamond Alkali Co.

Photograph: Nelson Stud Welding Div.

● **1st, Nail, Then, Hammer**—On this metal deck installation job the rivets were first set by a stud welding gun. Next the metal deck is put in place, hit with a rubber hammer, the stud pierces the deck. Finally a rubber washer is slipped on the stud and the job completed with another blow

PROTECTION— an Important Function of Control Equipment

What controls do . . . Overload protection . . . Relay characteristics and types . . . Starters . . . Short circuit protection . . . Under voltage release . . . Phase failure and reverse phase protection . . . Field failure and incomplete sequence . . . Use of limit switches and interlocks

By R. W. SMEATON, Application Engineer, Allis-Chalmers Manufacturing Co.

AMONG THE functions generally performed or governed by motor control equipment are: starting; running; speed regulations; stopping; and, protection. Of these, perhaps the most important is the protection such equipment provides to machines, motors and operators. The protection that this control equipment affords includes: overload; short circuit; undervoltage; phase failure; reverse phase; field failure; incomplete sequence; limit; and, interlocking.

Overload Protection

Overload protection is effected by a device which operates on excess current, not necessarily of short circuit proportions, to cause and maintain an interruption of current flow to the device governed. This protection is obtained in motor controllers by means of overload relays which cause the main contactor or breaker to open when the motor current exceeds the motor rating. If the driven machine is mechanically overloaded, this overload is reflected in increased motor current and temperature.

Assuming the motor is properly applied, protecting the motor from overload protects the driven machine as well. If the motor is undersize for the load, proper overload protection will prevent the motor from carrying an overload for a period long enough to cause overheating of the motor. If the motor is oversize for the load, the overload protection may be arranged to protect the load by allowing the motor to take only sufficient current to carry the full load rating of the driven machine.

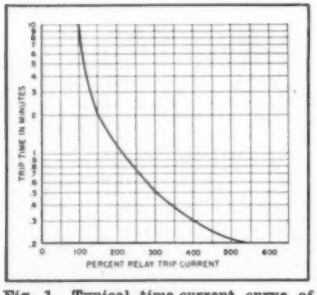


Fig. 1. Typical time-current curve of overload relays

In magnetic motor starters an overload relay opens the operating coil circuit after the motor current exceeds the overload relay trip current sufficiently long to cause the relay to trip. In manual starters, where there is no operating or holding coil, the relays trip the operating mechanism to open the main starter contacts.

If the controller is properly designed and applied, it should be able to carry the normal loads imposed on it by the motor. If the motor is overloaded, however, the control is also overloaded. Hence, in protecting the motor from overload, the control is also protected against excess current.

The heating of electrical machines is an inverse relation between current and time. If a heavy overload is applied to the motor it should be disconnected from its source of power quickly. If a motor is slightly overloaded, it can run for a considerable time before it reaches a dangerously high temperature. Standard overload relays are designed with a current versus trip-time characteristic to anticipate motor temperature characteristics and to protect most motors for heavy as well as slight overloads.

Standard relays are designed with a characteristic curve similar to that shown in Fig. 1. Where variation from this general characteristic of standard overload relays is made to meet certain load conditions the application must be carefully considered to be sure the equipment and are adequately protected.

In the two principal types of overload relays used on present day standard motor starters, motor current is passed through a heater element or induction coil. This current causes a heat sensitive element to move a contact release mechanism to open the contactor operating-coil circuit. In one type, the heat sensitive element is a bi-metallic strip, disk or coil which moves with change in temperature to a point where the trip mechanism operates. In the other type, the heat sensitive element is a low temperature melting alloy which melts and releases the trip mechanism. Both types have proven reliable through wide usage and years of service.

Bi-metallic overload relays may be designed to compensate for change in ambient temperature so that the relays ultimately trip regardless of external heat after the current through their heaters rises to a predetermined value. In the great majority of installations the motor and relay are in locations subjected to different temperature conditions. Even when the motor and controller are in the same locality, ventilation conditions of the relay and motor housing are invariably different. The compensated overload relay corrects for these temperature differences.

When conditions are such that the controller ambient temperature is higher than the ambient temperature of the motor, the compensating element of the overload relay recalibrates the tripping mechanism in such a manner that the heating element is not affected by local temperature conditions. It trips accurately on motor current only where an ordinary overload relay would trip due to high local temperature before the motor attained its permissible operation temperature. The compensated relay, therefore, prevents unnecessary and troublesome motor outage, gives more complete motor overload protection and allows full use of maximum motor capacity.

An additional advantage of bi-metallic relays is easy adjustment for closely adapting relay to motor load characteristics. The melting alloy type relay usually has no means of adjustment.

Standard three-phase motor starters, schematic diagrams of which are shown by Fig. 2, are supplied with overload protection in two of the phase leads to the motor. Either re-

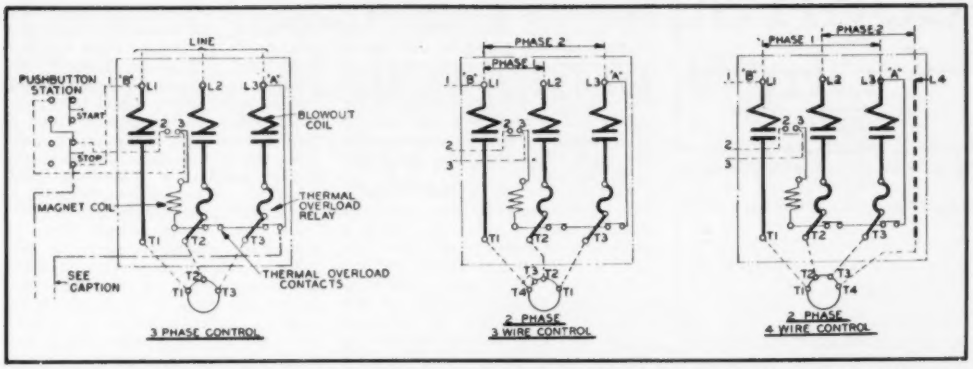


Fig. 2. Schematic diagrams of three-pole across-the-line motor starters with push-button connections. If, in the diagram at the left, a separate control circuit is used, omit wire B, remove wire A and connect as shown by the dotted lines

lay may trip the starter. This is considered adequate overload protection for most applications. There are some conditions where protection operative on the current in three of the phase leads to the motor is specified. If a motor operating on a grounded neutral or a 3-ph, 4-wire system develops a ground in the unprotected phase winding, this section of the winding may burn out.

If a line breaks or a fuse blows in the primary of a delta-wye or a wye-delta connected distribution transformer with its neutral isolated, excessive current might flow in the unprotected lead to the motor. A third overload relay will give the necessary additional protection in these instances. With either delta-delta or wye-wye connected transformers, standard overload protection is adequate.

Short Circuit Protection

In motor control, the maximum operating overload that is a locked rotor condition, is considered to be: six times normal full load current for alternating current industrial motors and control apparatus; four times normal full load current for direct-current motors and control apparatus used with reduced voltage starting; and, ten times normal full load current for direct current industrial motors and control used with full voltage starting.

It should be understood that these overloads are currents which may persist for a short time only, usually a matter of seconds. Any load in excess of the maximum operating overload is considered a short-circuit condition. Since neither the control nor the motor are designed to withstand short circuit conditions, the longer the short circuit exists on the system the more extensive will be the damage. Hence, to protect electrical equipment, short circuits must be removed from the system as quickly as possible.

Since overload relays are designed to protect the motor and control where a normal overload on the motor tends to persist long enough to damage the equipment, time vs. current characteristics of the short circuit protection must be carefully coordinated with that of the overload protection so that the short circuit protection does not operate under normal overload but operates quickly under short circuit conditions.

When fuse disconnects or small air circuit breakers are mounted in the starter enclosure for short circuit protection the control is called a combination. The air circuit breaker can, within its rating, interrupt short circuits more than once and allow service to be returned without delay. All poles on the breaker operate simultaneously, thus eliminating the possibility of single phasing. A visual trip indication is provided on the outside of the starter enclosure.

Circuit breakers supplied in combination starters are of the thermal trip type, however, some of the larger breakers are provided with dual trip which consists of instantaneous trip elements added to the thermal breaker. Breakers with dual trip operate faster on severe short circuits.

The fuse is a low cost short circuit protective device that is inexpensive to replace. It operates dependably and quickly to clear short circuits and minimize damage to associated equipment.

For squirrel cage, synchronous and wound rotor motors which require a short circuit interruption capacity of 150,000 kva at 2300 v or 250,000 kva at 4600 v, 50 or 60-cycle, high interruption capacity current limiting fused starters, as shown by Fig. 3, are used. These fuses limit the short circuit current to a low, safe peak value and reduce magnetic forces on current transformers, connections and contacts prior to interrupting the circuit. They are equipped with indicators to show when they are blown.

For large low-voltage motors, low-voltage, metal-clad switchgear starters with 15,000 to 100,000-amp interrupting capacity are used. For large 2,200 to 15,000-v motors, metal-clad, vertical-lift switchgear starters with 50,000 to 500,000-kva interrupting capacity are used. These switchgear starters are supplied with instantaneous magnetic relays for tripping the breaker in case of short circuits. For normal operating overload protection, either thermal or induction overload relays are used to trip the breaker.

Undervoltage Protection and Release

With undervoltage protection the starter interrupts the power circuit on reduction, or failure, of line voltage and maintains this interruption until the operator operates a manual pilot device to reclose the starter.

In Fig. 4 pressing the START button energizes the contactor coil. The closing of the contactor also closes an interlock circuit which parallels the START button contacts, and the line contactor is held in even though the START button contacts are open. When an undervoltage occurs, the contactor opens, opening the interlock, and when the power returns, the line contactor coil is not ener-

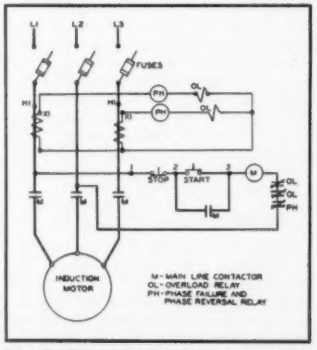


Fig. 3. Three-phase full voltage starter with fuses and phase failure reversal relays

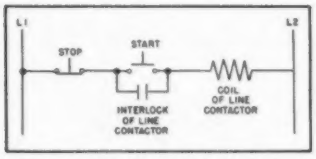


Fig. 4. Undervoltage protection circuit

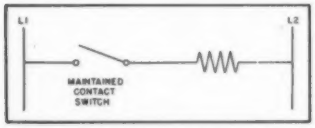


Fig. 5. Undervoltage release circuit

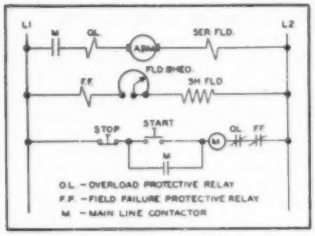


Fig. 6. Field failure relay in a d-c starter

gized until the START button is again closed. This is called three-wire control. The normally open interlock is standard equipment on all magnetic starters.

Undervoltage protection is essential on many drives where unexpected starting might prove dangerous to personnel. Unexpected starting of a motor driven saw, shaper or lathe presents a definite hazard to the operator or maintenance man. Undervoltage protection is also a definite advantage in many plants where the re-starting of all motors simultaneously would throw too heavy a load on the power supply.

When a control provides undervoltage release and a voltage failure occurs, the motor is de-energized during the power failure. Upon return of power, the motor re-starts immediately. Undervoltage release is well applied on certain applications, such as fans for ventilation or water pumps where it is essential that the motor be re-started without the attention of the operator. The magnetic control circuit for undervoltage release, called two-wire control, is shown by Fig. 5.

Phase Failure Protection

A polyphase motor may accidently be operated on a single phase if, after the motor is up to speed, a contact on the starter opens due to wear or dirt, if one fuse blows or when a line break occurs between the power supply and the starter or between the starter and the motor windings. The motor cannot start on single phase but may continue to run on single phase once it has started. If one phase in the circuit to the motor is opened when the motor is fully loaded the current taken by the remaining phase in the motor will increase to a value which will cause the overload relays in the starter to trip and remove the motor from the line.

However, with a delta-wound, three-phase motor, there are two parallel circuits when the motor is operating on single phase. One circuit is high in impedance and the other is low. There is a narrow band of loading at approximately 65 per cent full load where the overload relays will not trip and where the current in the low impedance circuit is high enough to cause overheating. A greater load will cause the overload relays to trip and a lighter load will not damage the windings on single phase operation.

Cases of damage to small industrial motors are so infrequent that it is considered unnecessary to add single phase protective relays to the motor starters but these relays are often added to motor starters that control large and expensive motors.

Reverse Phase Protection

If one set of phase leads to a starter were accidentally reversed, it would cause reverse rotation of the motor. On machines intended to run only in one direction this might cause considerable damage. Most motor starters are not protected against phase reversal since this adds expense and reversal of a phase on a system rarely if ever occurs. Occasionally, however, customers specify that this protection be added to starters as in Fig. 3, feeling the protection offered by the addition of a relay is justified by the damage that could occur in the rare instance of phase reversal.

Field Failure Protection

If the shunt field of a direct current motor loses its power source the motor loses most of its counter-voltage in the armature, this tends to greatly increase the speed. If the motor is lightly loaded speed will increase until the windings fly apart from centrifugal force. If the motor has a load sufficient to hold down the speed, the overload relay may disconnect the motor before it damages itself with speed. However, to protect the machine against field failure, particularly where field rheostats are used for speed control, a field failure relay is frequently used since the failure of the field rheostat might accidentally open the field windings. A field failure relay in a d-c starter is shown by Fig. 6.

On synchronous motors there is the same possibility of losing the field. If the field is opened after the motor is in synchronism, the motor will drop out of synchronism and try to re-synchronize. Unless the field is re-energized the motor start windings will burn out. Hence, as an additional protection, field failure protection is often applied to synchronous motor starters.

Incomplete Sequence Protection

When starting a synchronous motor it is important that the motor complete its starting sequence in a given amount of time since the starting winding of the motor might be damaged if it failed to synchronize in a given length of time. An incomplete sequence relay is provided with these starters which is the same as a thermal type overload relay as shown in Fig. 7. It is connected with the heater across the control voltage circuit in series with a normally closed interlock contact on the field contactor, and on reduced voltage starters, also, in series with a normally closed contact on the running contactor or breaker.

If the starter fails to complete its sequence the relay will trip and open the starting contactor coil circuit. Thus the relay provides complete protection for the synchronous motor starting winding against overheating during the starting period. Protection is also provided for the motor starting auto-transformer, reactor, or resistor to prevent overheating due to continued operation on the reduced voltage starting tap.

Incomplete sequence relays are equally important on reduced voltage induction motor starters to prevent prolonged operation of the

(Continued on page 71)

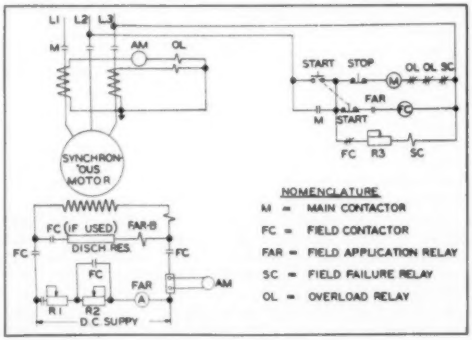


Fig. 7. Auto-transformer type starter with incomplete sequence protection

How FOREMEN'S MEETINGS Help in Maintenance Work

What meetings do . . . How frequently they should be held . . . A good order of procedure . . . Dissemination of information and maintenance schedules to production department heads . . . Scheduling week-end work . . . Priority ratings for projects . . . Reviewing earlier work

By JOHN D. BREEDING

UNQUESTIONABLY the key to successful unity of purpose in plant maintenance is the sharing of plans and ideas among members of the supervisory staff. This can readily be done through scheduled meetings of all foremen and supervisors in the maintenance department. The frequency of these meetings should be governed by the size of the plant and the projects at hand.

In a plant of 1500 employees with 10 foremen in the maintenance department, it is advantageous to hold daily meetings. In plants of smaller size or with fewer maintenance problems the meetings may be held less frequently.

As to time, 1:15 will usually be found most advantageous to all concerned. This allows all foremen and supervisors to bring up the problems encountered in the morning and also plan for the afternoon and the following day's work. If worker's lunch-time is from 11:30 am to 12 noon the foreman has time before the meeting to start the men on the afternoon's work.

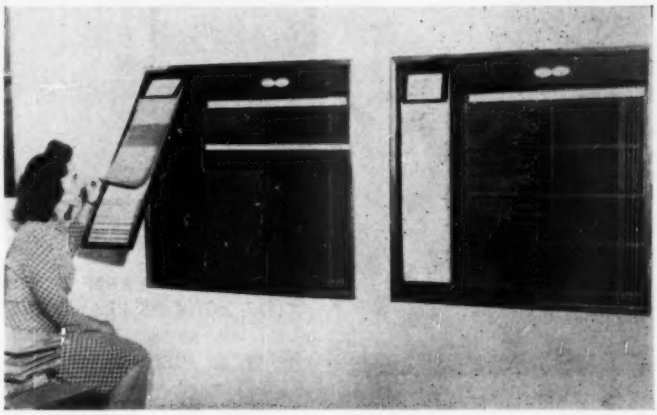
Daily meetings will probably consume about 45 min to 1 hr in the early stages but once the routine is established, 30 min should suffice. At meetings the superintendent of maintenance should preside and all foremen and supervisors required to attend unless excused for some emergency.

General order of business found best suited to daily meetings is as follows:

1. **Individual verbal reports from each foreman or supervisor concerning progress on active projects and current problems. These reports cover condition of equipment parts or repairs required, where cooperation of other members of the staff would be helpful, scheduling of work, and personnel problems.**

2. **After all individuals have had the opportunity to present their problems, the superintendent of maintenance endeavors to answer all the questions using if possible suggestions presented by the various persons present.**

3. **The next order of business is the presentation by the department superintendent of new projects, use of new equipment, policies handed down from top management, etc. All projects should be given a priority rating based on their importance to top management. This results in the entire group acting upon the most important projects first with a unity of effort. All information gathered by the superintendent of maintenance with regard to projects, delivery of parts, methods of repair, production schedules and new work, is thus passed on to the supervisory force so that all are well and equally informed as to the overall plans of the department.**



In one plant the progress of all active maintenance and repair projects can be followed on these control boards. Similar boards are used for inventory control for common items in the maintenance storeroom

In one particular plant, operating on a 24-hr 5-day week schedule, Thursday was found to be the latest time that plans could be made for the week-end repairs. In the Thursday meeting, the week-end repair schedule is fully discussed. As Saturday is a time-and-one-half and Sunday is a double-time day, all projected repairs are carefully weighed against these facts.

At the conclusion of this Thursday meeting, a mimeographed week-end repair schedule is made and copies sent to all department heads and the plant manager. Should this conflict with emergency week-end plans, the schedule is immediately altered to accommodate the plans of management, otherwise they stand. This allows time for all department heads to become familiar with equipment scheduled to be out of service.

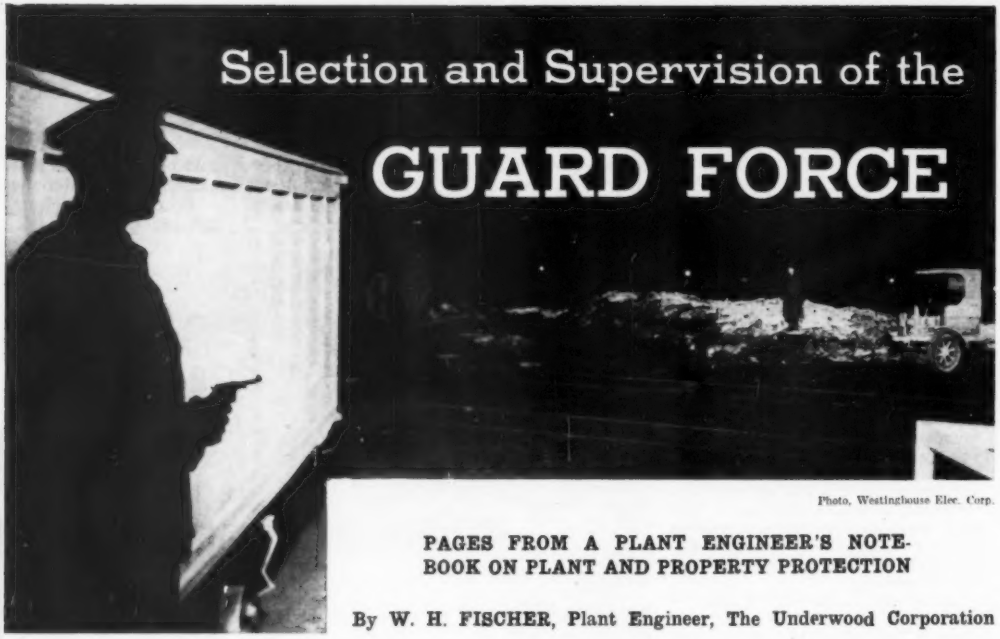
The meeting on Monday is largely devoted to a summary of accomplishments for the preceding week and week-end. It is well to have all foremen and supervisors submit a brief written summary of the week's activities and accomplishments. These reports should cover all major repairs, new equipment, new construction, equipment on test and an estimate of the time required to complete all unfinished projects.

These reports can be condensed by the superintendent and a mimeographed copy sent to all department heads and the plant manager. This brief report keeps everyone informed and gives a record of the status of all equipment, projects and accomplishments throughout the plant.

These weekly reports also provide a valuable reference source of information to the superintendent of maintenance, plant engineer and plant manager in regard to date of installation of various equipment, material on test, major repairs and trouble spots.

This system of operation has many advantages. Foremost is the opportunity for the foremen to sit down with the boss, relax for a few minutes and talk things over. It is surprising how many ideas come forth, how much initiative is developed and how much cooperation and unity of purpose is accomplished by these few minutes each day. This system as outlined is not theory, it has been tried and proved in our organization.

Selection and Supervision of the GUARD FORCE



Photo, Westinghouse Elec. Corp.

PAGES FROM A PLANT ENGINEER'S NOTE-BOOK ON PLANT AND PROPERTY PROTECTION

By W. H. FISCHER, Plant Engineer, The Underwood Corporation

No. 1. Product: The product manufactured has a distinct bearing on the number of guards required. Raw materials before processing are with certain exceptions usually safe from theft. Finished products which have a domestic attraction must be guarded; i.e., padlocks, small arms, leather and rubber footwear, typewriters, adding machines, electric toasters, lamps, radios, etc.

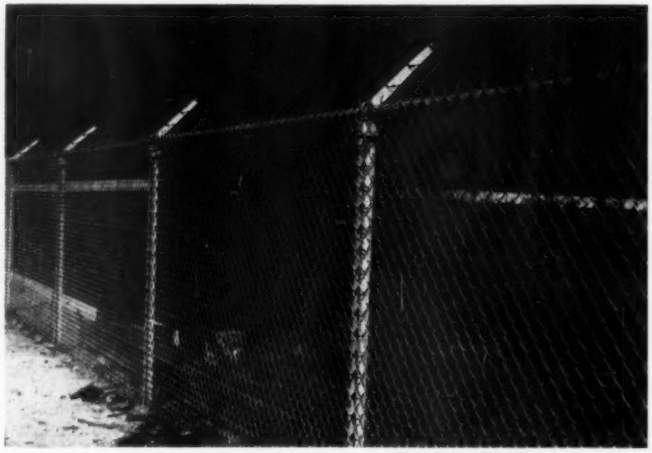
No. 2. Plant: The type of plant construction must be taken into consideration. Do all employees enter and leave through one entrance, or several? If the former, less manpower will be required to check employees coming in. These employees should have certain identification badges for quick check. This is necessary to keep out undesirables. Exit checking is required to see that plant property, small tools, material and finished products are not stolen in overnight bags, lunch boxes, etc.

No. 3. Entrance: Is the factory entrance separate from the office entrances, such as those for employment, personnel, welfare, purchasing, accounting? If so, possibly a guard should be provided, again depending on the nature of the business.

No. 4. Passes: Material received and shipped; if handled at one or two locations or entrances, by trucks or by rail. If receiving and shipping departments are separate units located at the edge of the plant, they may be easily controlled by supervisors of the departments. If, on the other hand, these units are deep in the plant, and shipments are by trucks, the set-up should be under control of the guards, with the addition of truck passes, these to show contents of trucks leaving plant with company or other goods not from the plant. Pass can be marked N.C.G. (non company goods) for any goods or shipments on truck when it comes in, and not destined to the company. These passes to be taken up by a guard at the exit gate or door and filed in guard office, or with other official in charge of plant protection.

No. 5. Firearms: If plant is located within city or town limits with local police protection, it is one thing, plant guards do not need to carry firearms. They should have batons or night-sticks. If the plant is isolated, both day and night guards should carry firearms and be trained to use them properly. The State Police will be more than glad to assist in the initial training.

No. 6. The Chief: The Captain, Sergeant, or Chief of Guards should be a man of settled habits, preferably a veteran, who is able-bodied and alert. He need not necessarily have



Photo, Cyclone Fence Div. of A. S. & W. Co.

Fig. 1. Along with an adequate and well-trained guard force, the most important factor in plant protection is a strong chain-link type fence topped with barbed wire

had former police training. He should however, know the plant and the products so well that he can advise his superiors on ways and means of averting petty thefts, (carrying of company owned property under overcoats and in lunch boxes, for personal use at home, or for sale.)

All men for guards should be a minimum of 5 ft 9 in. tall, of good physique, sober, steady habits, good nerves (not excitable), and it would be advisable to have guards on day shift uniformed to create a good impression on employees and visitors, with cap plates (Police) and badges showing number. Guard office should have at least one outside phone in case of emergency, and one guard stationed in office to answer phone calls and keep record book of all events reported, or passing through Guard Office.

No. 7. Scrap to Employees: In all plants certain materials, boards, heavy paper boxes, etc., have no value to the company and are thrown out as trash or scrap. Some of this material can be used by employees at home at no expense to the employer. It helps in employee relations to allow the employees the privilege of taking this material home, with proper permission, and a property pass signed by foreman or superintendent, after inspection of the material sent to guard office, to be picked up by the employee at quitting time. Overnight or traveling bags should be left at the guard office on entering plant.

No. 8. Duties: Duties of guards are to protect and safeguard plant property, to see that only employees or other authorized persons are admitted to the plant, that drunks and undesirable employees are evicted on orders from foremen or executives; to make periodic patrols. When the plant is not in operation, insurance companies demand an hourly patrol and report on conditions.

If the plant is sprinklered, guards should have full knowledge of where all shut-offs are. A scale drawing of plant showing doors, gates, stairs, elevators, sprinkler indicator posts, fire hose lines, should be in guard office and guards should be trained in its use so that no time will be lost in case of emergency. Intelligent orders can be issued and will be understood and obeyed, if all the guards know the score.

No. 9. How many Guards? State laws provide a certain amount of area per stairway and per door so that all employees can leave safely and quickly in case of emergency, these doors to be unlocked during working hours. This calls for a guard at each door, with one relief man to take their place during meals, etc., one guard to be in guard office, one at main office entrance as a receptionist, one at receiving and shipping gate to control truck traffic, or open and shut railroad gates at a side track.

This is for an 8-hr work day. If plant operates on a two-shift plan, double this number, plus a captain, or chief for day and an assistant for second shift; three men for nights for patrols, ringing clocks, checking toilets, to see that no prowlers or people taken ill on the first or second shift remain behind after plant closes. A certain percentage of manpower must be provided to give each man a day off in each week so that extra men will appear on payroll. Days off must be taken any day of the week, in rotation, and places filled by extras.

No. 10. Guard Reports: A complete report book should be maintained in guard office, showing for each day outside and inside temperature, weather, etc., as a heading, then any event, starting with time, i.e., "10:22 pm, leaking pipe reported by J. Evans on patrol, control valve shut off and sawdust spread on floor, all clear 10:44 pm—F. F. Doe." This can be used as evidence for damage claim or can be used and will be accepted in court, as evidence. All reports should be supervised daily by proper official.

Photo, The Union Metal Mfg. Co.

Fig. 2. Adequate floodlighting of plant grounds is essential to efficient night patrol work. Cars on the parking lot at left present little temptation to thieves under these lights. Below: Fences around remote areas of property should be well lighted and should have an adjacent strip of clear open space to facilitate rapid and effective patrol

Photo, General Elec. Co.

Rigging—

GIN POLE, SHEARS and TACKLE

Versatility of the gin pole, methods of its erection, case histories of its use in plants . . . Special applications . . . Use of a set of shears . . . How to get heavy weights near a ceiling

By H. B. McDERMID, Technical Correspondent

ON MANY construction jobs or in materials handling problems, when no crane is available, the gin pole is often the only solution. The pole may be any size, is usually made of steel pipe or of wood or almost any material that is strong enough. It should be light so it will handle easily. Usually it is held in a vertical position by four guy-lines attached at the top and leading to stakes or other solid anchorages. These lines should be located at approximately 90 deg spacings around the gin pole though the safety laws in some states require five lines. The theory is that if one line should fail the other four will hold the pole until a new line can be placed.

Suppose we are to put up a medium-sized pole in an open space. There are no nearby buildings, trees or other objects on which to attach a line for help in erecting. First, as shown in Fig. 1, lay the pole out on the ground with its butt or lower end where the erected pole is to stand. Attach the four guy-lines solidly to the top, and line them out, one to each of the four sides. One of these lines will stretch toward the butt of the pole, one to the fourth side away from the butt. There will now be a guy-line in each of four directions.

Next, we drive a stout stake or find an anchorage for each line at a point that the guy line can reach when the pole is standing erect. Now we overhaul our rope blocks or whatever hoisting tackle we mean to use and fasten it to the top of the pole. The load hook, as shown by Fig. 1, is lashed to the pole near the butt where we can easily reach it when the pole is standing erect.

Next, drive two stakes, say 4 to 6 ft up from the butt, one on each side of the pole. Lash the pole's butt loosely to them, so it can't scoot along on the ground, when we start to raise it. In general, we get all our rigging (that cannot be reached from the ground after the job is erected) done while it's on the ground. Then we raise the pole so the top is well off the ground, about 10 ft (a 2 in. by 12 in. plank 10 ft long makes a good prop) and station a man at each side guy-line to guide the pole as it goes up.

One man tends the back line—the one pulling opposite the butt—while the main part of the gang pulls the pole erect with the guy-line which leads out past the butt. All the guy-line men must be reliable as any one of them can easily let the pole get away and so spoil the complete job. As the pole comes erect the "back guy" man snubs it to hold it from over-travel.

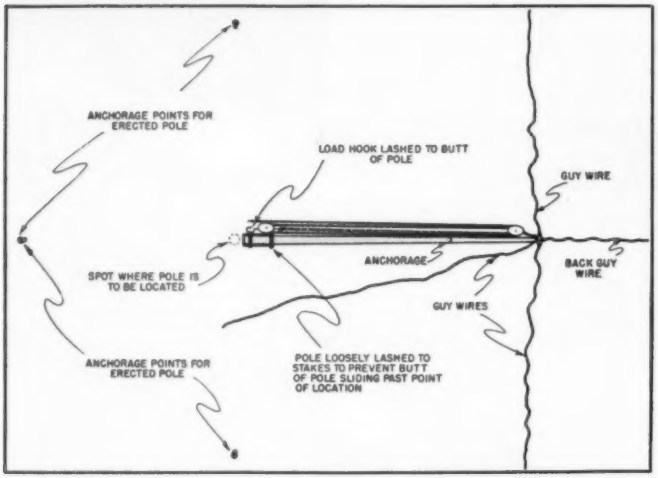

ANCHORAGE POINTS FOR ERECTED POLE
LOAD HOOK LASHED TO BUTT OF POLE
GUY WIRE
SPOT WHERE POLE IS TO BE LOCATED
ANCHORAGE
BACK GUY WIRE
GUY WIRES
ANCHORAGE POINTS FOR ERECTED POLE
POLE LOOSELY LASHED TO STAKES TO PREVENT BUTT OF POLE SLIDING PAST POINT OF LOCATION

Fig. 1. This is somewhat the way a gin pole should look when it is laid out on the ground ready to be raised. Be sure to keep all tackle and other equipment, which must be adjusted or used, near the bottom of the pole as shown

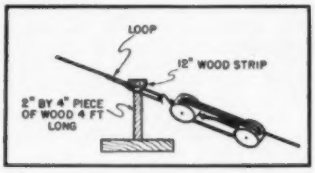


Fig. 2. This is a riggers' "monkey-tail" used to prevent the inaccessible upper end of the rope from twisting so much as to become inoperative

All guy-lines are then made fast, the load hook which had been lashed to the butt of the pole is released, and the outfit is ready to do useful work. All sorts of hoisting equipment can be used on a gin pole—rope blocks, chain falls—if the lift desired comes within their working range. The pole can be used for anything from small loads up to loads of many tons. Each pole, of course, must be rigged for its load, but I have seen giant 100-t electric overhead cranes hoisted to their runways on a single pole when being erected. One such crane was elevated 60 ft up to its tracks on one pole. The pole had been set near the balance point of the crane girders as the crane lay diagonally across the shop on the ground. After the crane had been hoisted to the proper level it was pulled squarely across the runway with taglines* and set down on it. We were ready to dismantle the rig in about ten minutes following the hoisting signal.

The outline of the method of raising a light weight pole has been given above. Suppose you have a pole too heavy to handle by manpower alone. Put up a light weight pole first, somewhat more than half the height of the big one. Hitch the

* Taglines are comparatively light lines attached to the ends of hoisted loads. They are used to guide the load into position. —Editor.

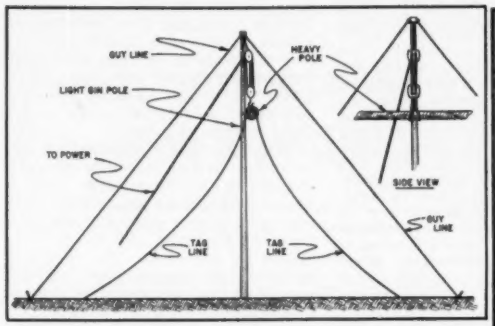


Fig. 3. Here is one way of raising a heavy gin pole by using a smaller one to do the work. After the longer pole is hoisted to the correct height it is turned and then set down on end; it is controlled by the tag lines fastened to it

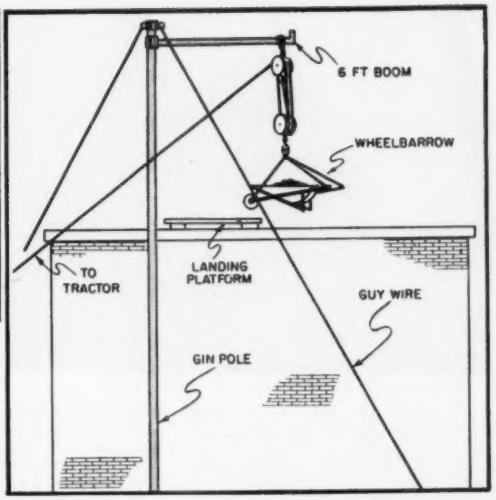


Fig. 4. An interesting use of the gin pole is shown in this sketch and described in the accompanying text. The concrete was hoisted at a faster rate by this method than it would have been by a regulation concrete elevator

big pole to the hoist of the little one at the "balance." Two taglines are attached to the butt so its motion can be controlled after it gets up out of reach. Hoist it to the top of the little pole as it lies level. When high enough, merely up-end it with the taglines, set it down and make all the guy-lines fast. See Fig. 3

Two or three actual examples of work of this type come to mind. A 6-in. I beam, 50 ft long, was to be placed for use in process work as an overhead track for trolleys. It had to go tight up against a fifth floor ceiling. Every possible inch of headroom was needed to make the processing successful. There was no way to get the piece into place except through a window. The sash could be taken out and one end of the I beam dragged in over the sill by using a rope block for power. But when the end of the I beam hit the ceiling the job stalled. It possibly could have been tilted over the window sill and dragged in, but with 40 ft of uncontrolled I beam dangling and whipping around in the wind the success of that plan looked doubtful.

So four pieces of 3-in. pipe were obtained. These were joined, end-to-end with pipe couplings. The workmen then got up on the flat roof and pulled the pipe erect. Because such a length of pipe was pretty limber, they put a second line at its middle and ran this line to a high window. This second line also was used as a hoisting line to relieve the pipe and serve as added insurance. Once erect the pipe gin pole was safe enough. It was set about 30 ft from the building and was able to pick up the dangling end of the I beam, elevate the end until the entire beam was lying level.

Another case: Some 15 yd of concrete had to be hoisted 18 ft to a flat roof and placed in forms beside it. A pole was put up close to the building with a 6 ft boom hung at its top so loads would clear the pole and also could be swung over the landing stage when the load had been hoisted high enough. A small tractor was used for power on the hoist. A three-part hitch was used and the concrete was handled in wheelbarrows. Rings on two parts of the three-part hitch were slipped over the wheelbarrow handles, while the third part held a hook which engaged the rim of the wheel. This arrangement is pictured in Fig. 4.

When the boom was high enough it was swung over the landing stage and the wheelbarrow lowered and unhooked ready to wheel off to the form. The attendant then hooked on an empty wheelbarrow, using the hook only, and it was lowered for another load. The tractor man had only to shift from forward to reverse and vice versa and as soon as he learned his limits of travel the hoist became almost automatic in operation.

For heavy, permanent and rough work 4 in. extra heavy pipe with special long clamp joints to stand highly abusive treatment is often used. A bolt can be put through the pipe, about 6 in. from the bottom and projecting 6 in. on each side, for use in moving the pole short distances without taking it down. Two men with crow bars will move a pole pretty fast that way. A precaution: constantly adjust the guy lines as necessary, to keep the pole erect.

A wooden footing made from a 12 in. piece of 2 in. by 8 in. lumber, with cleats nailed to hold the pole from slipping off, will prevent the pole from sinking into soft ground. On heavy gin poles, it is sometimes desirable to insert a set of rope blocks at the ground end of each guy line, to provide a safe means of adjusting them when under heavy load. This requires some means of preventing the upper and inaccessible end of the blocks from twisting and so rendering the block inoperative. This can be accomplished by taking a 2 in. by 4 in. board, 4 ft long and nailing a 12 in. piece of

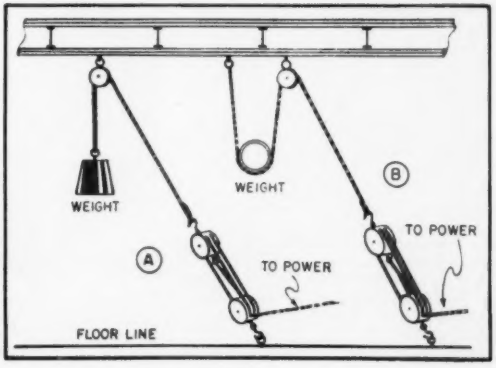


Fig. 5. Here are two methods to use when hoisting loads close to the ceiling. These methods are especially effective where the weight can not be raised high enough with standard two block rope rigging or with chain falls

Fig. 6. This photograph was taken from the author's collection. The 100-t hydraulic turbine runner was landed under the power house crane by means of a pair of shears, shown at the left. The hoisting engine, driven by compressed air is located 40 ft below on a dry patch of Mississippi River bed

wood across one end and a much heavier piece across the other end. This device, shown in Fig. 2, is then hung in a loop formed in the lower end of the guy line. The upper block of the rope falls is also hooked in the same loop. This apparatus, which is called a "monkey tail" keeps the block from twisting.

Another close relative to the gin pole is called a set of shears. It consists of two vertical members, set some distance apart and rigidly joined together at the top. In the more permanent installation the shears are hinged at the bottom to seeurely anchored foundations. A set of shears needs guy-lines fore and aft only. They are often rigged to move through quite an arc on their hinges by power-operated cables. They are often seen on roofs of large buildings where they are used for hauling up roofing material. They have been rigged in industrial plants to be used as an emergency hoist for heavy machinery, until such time as regular cranes can be installed. This apparatus has handled machine parts up to 100 t taking its loads from freight cars 40 ft below. This particular job is shown in Fig. 6. Another job of a similar type was handled with a modified shears. This type of hoist has the advantage of having the supports entirely out of the way of loads, but can be swung in only one plane.

Chain falls are a valuable aid to the hand power rigger. They have the disadvantage of heavy weight, especially when the operator wishes to get his load as high as possible under restricted head room. Then, when he is fighting to get every available inch of height, he often wonders whether the capacity markings on the name plate do not refer to the weight of the rig rather than the amount it can lift. Two different procedures to follow in getting loads close to the ceiling are shown in Fig. 5. If a single line of wire or hemp rope will lift the load, here is a method that is often used: Take a single small block, as at A, Fig. 5, hang it as close to the ceiling as you can, attach the load to one end of the rope and apply power on the other, by means of rope or chain blocks fastened to the floor. It often will get you those last few inches of precious lift you need so badly.

Need Two Anchorages

Another way of solving the same problem may be employed if you can get two high anchorages for your rigging. These anchorage points must be on each side of the point where you are to land your load. Fasten an end of a rope to one point and a pulley to the other. Then pass the loose end of the rope under the load and up through the pulley and apply your power. As the rope is pulling from the bottom of the load it can be hauled up tight against the ceiling. Rigs of this type can only be used in pairs, one near each end of a piece of pipe or a steel beam. Before the piece is brought up too far it must be turned and held "work ways" so it will land the desired side up as it is bound to roll in the loops of rope as it hoists.

Sometimes the fastening that can be gotten on a ceiling does not seem too strong. Given a heavy load to land on a platform close to the ceiling build a ramp up to the platform from the floor and pull the load on rollers up the ramp. The ceiling is relieved of considerable of the weight as the ramp carries a good proportion.

Another point that has not been noted above is as follows: Many times loads are to be moved *down* to a lower spot and the know-how of snubbing from the higher to the lower spot is valuable. Some workers make the mistake of using too many turns of rope on the anchorage they are using and get in a bad mess by doing so. The average man can easily hold, by snubbing, as much weight as can be borne by a ¾ in. manila rope. This can be done by taking one turn around a 2 by 4 in. If the load is light, bending the rope around two, or at the most three, of its corners is plenty. Precautions should be taken to make sure that the part of the line bearing the load does not climb on top of the loose end being fed around the timber or other snubbing point or that it does not jam in any other way. If it does jam it is most likely that another tackle will have to be rigged to raise the load.

Where PM Is All Wet!

A diver emerges from the bottom of the Mississippi River after he has repaired intake strainers for the Mound Street Plant of Union Electric Company of Missouri. The strainers are located approximately 60 ft from the plant and are checked about every six months to prevent clogging

How Factory Elevator Requirements Are Fitted to Production

By **EUGENE E. NOBLE**, Supervisor of Engineering Office Services, General Foods Corporation

VERTICAL transportation in an industrial building is today as accurately engineered and carefully fitted to the plant's production as any other phase of operation that will improve production efficiency and lower costs. Such engineering takes into account future as well as present production programs, and existing elevator equipment is modernized to keep pace with the plant's needs.

How engineers go about fitting elevator equipment to plant production is revealed in a typical analysis of the elevator requirements of a food processing factory, a division of General Foods Corporation in the Chicago area, which was recently faced with the problem of handling a 23 per cent increase in production of one product and a 50 per cent increase in another for 1949, as a result of installation of new processing machinery.

It was apparent that their two freight elevators, of the old-style hand-rope operated type, in use in the factory for the past 36 yr, would not be able to handle the increased load. The question was how much renovation was required — whether to add a third elevator to the vertical transportation system, modernize both the old elevators, or modernize only one of them.

The first step was to obtain accurate figures on utilization of present equipment. Examination of present production schedules and materials handling methods showed that the two elevators made an average of 323 one-way trips per day consuming 178 min. in travel time; that unavoidable delay used up 54 min.; that loading and unloading 311 min.; or a total of 543 min. for the two elevators.

Two men were used on each elevator and the cars were being utilized 87.5 per cent of the time, the remaining 12.5 per cent of the time being unavoidable delay.

Analysis of the stepped-up production program indicated that the elevators would have to be utilized 109 per cent of the time, obviously impossible.

The existing elevators traveled only 50 fpm and carried a 186-lb. minimum overload on 27 per cent of their trips. Such overloading is not desirable, therefore the safety factor also had to be taken into consideration in planning modernization of equipment.

To determine exactly how much time was being consumed in present elevator operation, time studies were made.

These studies revealed, for example, that every time one of the elevators was loaded or unloaded, 18.87 sec. were required in opening the doors, dropping the threshold plate, picking up the threshold plate and closing the doors.

The average number of times each elevator was loaded and unloaded each day likewise was determined. If an item was received on the second floor, stored on the fifth and used on the fifth floor, the elevator would be loaded once, unloaded once. But if the item was received on the second floor, stored in the basement and used on the fifth, the elevator would be loaded twice and unloaded twice.

Possibility of handling freight with power industrial trucks was examined, but floor load capacities permit fork trucks on second and basement floors only. Pallets were dropped on caster skids and hand-trucked on and off the elevators. The elevators held three caster skids or four 4-wheel trucks.

A study of receiving and shipping records of the factory revealed that freight handling varied from day to day but that on 203 out of 303 days the volume was 15 per cent above average. Elevator requirements necessarily had to be planned to allow a margin of capacity and speed to take care of this excess.

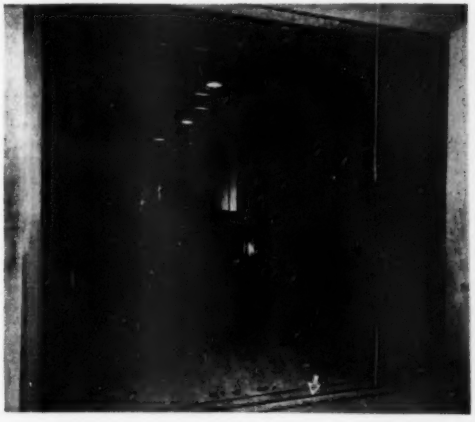
Extending the utilization figures obtained for existing elevator equipment to the planned increase in production for 1949, it was determined that elevators would have to make 374 one-way trips instead of 323, using 204 instead of 178 min. in travel time; that there would be 62 instead of 54 min. in unavoidable delay and 361 min for loading and unloading the increased amount of materials instead of the present 311 min.

Total time that the two elevators would have to be in use with the increased production program would be 627 instead of 543 min.

As a result of these freight handling requirements, plus the need to avoid overloading from the safety standpoint, it was determined that a fully-automatic Otis electric elevator of 8000-lb capacity and a speed of 150 fpm, to replace one of the antiquated hand-rope elevators, would provide adequate capacity to accommodate the increased production.

With the present elevators traveling 50 feet per minute, each elevator could make only 250 trips with two men during each day shift. With the higher speed electric automatic elevator the number of trips with it could be increased to 328. Using only one man, the hand-rope elevator could make a maximum of 159 trips; with the faster modern equipment, 187 trips.

From this it was determined that by keeping two men on each elevator and replacing one of the hand-rope elevators with automatic equipment, the combination will operate at 92 per cent efficiency, more than adequate for 1949 production needs and leaving an 8 per cent margin for the future. Two automatic elevators would be utilized productively only 87 per cent of the time and it was decided that this excess capacity is not needed at present.



Self-leveling (indicated by arrow), the new automatic electric elevator saves most of the 18.7 sec. required to open and close doors, drop and pick up threshold plate, on old rope-operated car. At 383 trips per day, this is a considerable item, helping increase utilization from 87.5 per cent to 92 per cent

A TAILOR-MADE

Simplified Preventive Maintenance

PREVENTIVE MAINTENANCE, in one form or another, has always been with us. Prior to World War II, however, it often was a hit and miss proposition not to be dignified by the terms of "program" or "system." During the war, when irreplaceable and often irreparable machines had to be kept functioning an increasing amount of attention was given to preventive maintenance. Paradoxically, though the same condition of hard-to-get materials prevailed in the immediate post-war period, many plants let up on the programs; money was easy to get, budgets were flexible and not rigidly enforced.

In the present-day buyers' market and era of keen competition, plant engineering departments are giving a lot of thought and action to preventive maintenance. Regularly scheduled and directed check-ups of machines and equipment are answers to elimination of waste in prematurely burned-out equipment.

The employment of the most expert supervision or skilled maintenance crews is not enough. Neither does the answer lie in an over large inventory of maintenance items. These require storage and are themselves liable to obsolescence. The solution lies, rather, in the employment of some system which prompts scientific and timely inspection, which curtails emergency repairs, and facilitates discovery of that point, in the usage of any machine, where the law of diminishing returns sets in.

Very often preventive maintenance records are combined with property records with the result that the right amount of equipment is on hand at all times and is maintained in top operating condition. Most frequently property records are complete in themselves furnishing all details on the equipment and providing concrete proof of capital investment and its most economic use.

The systems which are the subject of this article consist of several kinds. First are the maintenance records, next are the property records and last, inventory records of maintenance items. Inspection work expended upon equipment which does not require it is, obviously, uneconomic. Scientific preventive maintenance inspection at intervals regulated by consideration of type of equipment, relative operative "wear and tear" and length of continued operations, prolongs the life of the machine and reduces the loss of time and money which are inevitable with breakdowns.

All the records which make up these systems are alike in their visible control. There is no need to search for facts or figures; signals point these facts out. Control may be centralized in one or in a battery of cabinets. Or they may be decentralized with book units and deal with and be accountable for the dependable performance of individual and complex machines.

In Case Study No. 2, below, the maintenance superintendent has found that the record has accomplished the avoidance of motor breakdown and the reduction of major repairs since minor repairs are made before they can cause major failures. More efficient use of the time of maintenance men can be made since their time can be scheduled as much as a week in advance.

Another result of this record-keeping is the establishment of responsibility for motor wear. Analysis of past experience points out whether failures are due to abuse of the motor by machine operators or to careless maintenance.

It is necessary that records be maintained that produce day-by-day figures on original, replacement, depreciation

CASE STUDY NO. 1

The many thousands of items of equipment in this large aircraft manufacturing plant are controlled by a battery of seven fireproof file cabinets. Simplicity of control is attained by typing into the visible margin the name of the equipment, its number and location.

As each item of the equipment receives its signal-dictated periodic inspection the results are entered on the outside of the foldover flap of the card. A blue signal, moving over a monthly scale, is then advanced to a position over the week and month in which the next inspection should take place.

An orange signal, at the extreme right of the visible margin, moves over a percentage scale to chart the amount of depreciation to be written off on each item. Another signal flashes the number of the department in which the equipment is currently located. By the color of this signal it is possible to tell which of eight plants contains the item.

All historical data on the equipment is handy, though concealed, and includes a costed tabulation of supplemental purchases made, with space provided for totalling all of the depreciation, repair and maintenance charges.

A record of this type provides the plant engineering department with centralized administrative control of inspections, repairs and maintenance as well as furnishing complete details of the equipment and all supplementary parts purchased as well as depreciation costs.

CASE STUDY NO. 2

The loss of machine and man hours resulting from the preventable failure of electric motors driving machine tools is avoided by this manufacturer by using control-of-maintenance records.

One record serves as an index to all motors with unit cards showing motor number, location and description. These cards, all printed alike, show by their color whether they are company-owned, D-C or A-C, variable speed or portable. This record serves as a cross-reference to a second file.

Three forms comprise this second file. Two are housed in the face of the pocket and one in the back flap of the preceding pocket. Two are virtually identical, one a heavy bond "schedule" copy and a second lighter weight "office" copy of the maintenance record. The former is slightly longer so that its turned-back stub functions as the visible margin for both forms. A circular hole is die-cut into the right-hand portion of this margin and this form is permanently contained in the pocket. Absence of the "schedule" copy is obvious because a brown spot aligns with the die cut hole.

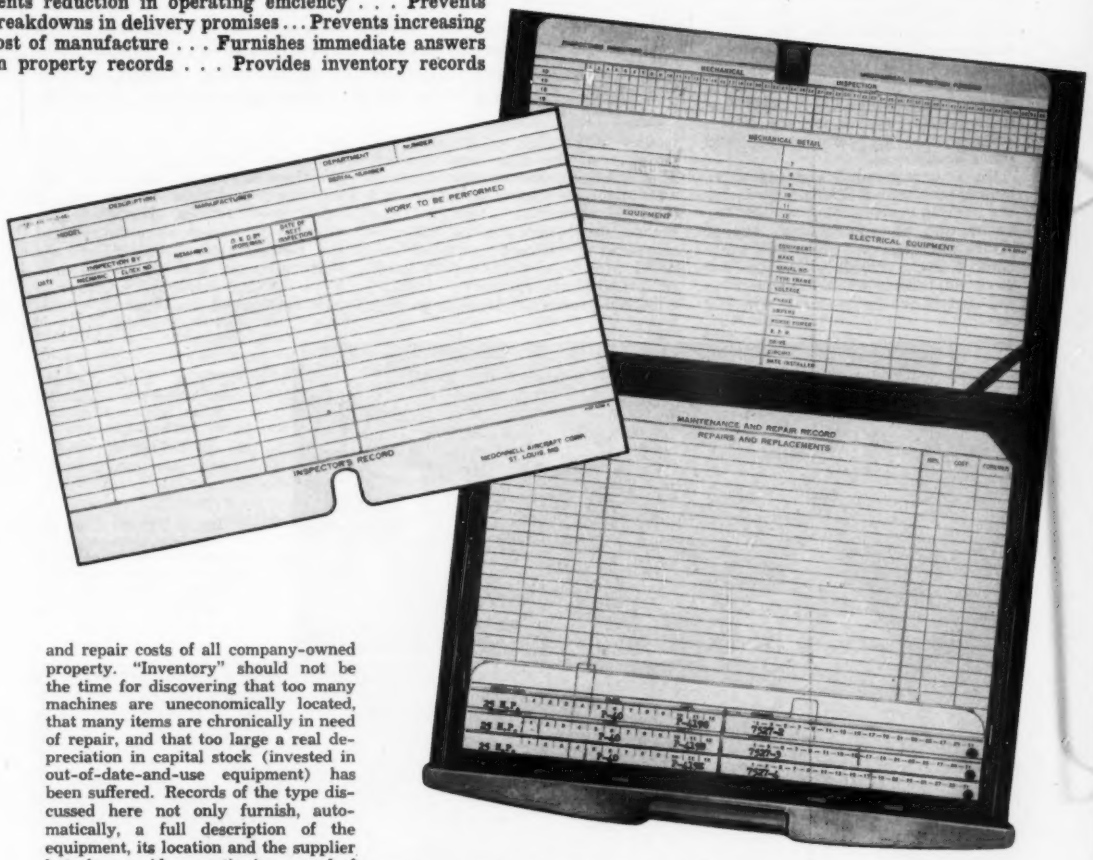
A signal over the date scale reveals when the next motor test should be scheduled. At that time the schedule copy is withdrawn, initialed for one of the maintenance men; when the work has been completed the card is returned with all data on repairs noted.

Housed in the back flap of the preceding pocket is a foldover test card. A 3-cycle semi-logarithmic chart shows by graphed test dates the motor resistance in ohms or megohms.

Plant Engineering
Product Application Feature

System for Control of ALL Plant Equipment

Prevents interruption of production schedules . . . Prevents reduction in operating efficiency . . . Prevents breakdowns in delivery promises . . . Prevents increasing cost of manufacture . . . Furnishes immediate answers on property records . . . Provides inventory records



and repair costs of all company-owned property. "Inventory" should not be the time for discovering that too many machines are uneconomically located, that many items are chronically in need of repair, and that too large a real depreciation in capital stock (invested in out-of-date-and-use equipment) has been suffered. Records of the type discussed here not only furnish, automatically, a full description of the equipment, its location and the supplier but also provide a continuing record of additions and betterments and show the increase or decrease in tangible property investment.

IF YOU WANT SAMPLES—

Sets of typical preventive maintenance and property record cards will be made available to PLANT ENGINEERING readers. If you want samples or additional information just address a letter to the Editor or write "PM System," on the postage-paid card elsewhere in the issue

HERE'S HOW ONE SYSTEM WORKS

● 1. Experience and performance, as noted on the inspection record in the top flap of the pocket, are combined to set up a pre-arranged and tested inspection schedule. ● 2. A glance at the slide reveals, at once, by means of colored signals permanently inserted in the visible margins, those items which are due for inspection. ● 3. Periodic and scientifically scheduled preventive maintenance check-ups are accomplished by withdrawing the "floating inspector's" record, as shown at left above, at the time specified by the signal. ● 4. Specific instructions for the job to be done are entered on this inspector's card which is then routed to the maintenance man as a work order and report sheet. ● 5. When the inspector's card is returned to its place in the pocket, completion of the job is signalled by the reappearance of the form through the die-cut hole shown at lower right above. The signals are then advanced to the date specified for the next scheduled inspection. ● 6. Details taken from the inspector's card are posted to the maintenance card, permanently housed in the lower half of the pocket, thus providing a continuing record of maintenance activity which enables ready determination of the point of diminishing returns on the equipment

A Workable PM Program for HEATING SYSTEMS

By J. J. NOVOTNY, Chief, Facilities Engineering, The Glenn L. Martin Co.

Need for preventive maintenance program, and the consequences of not having one, are outlined . . . Repair materials must also be coordinated to the job . . . Air conditioning and heating systems afford year 'round work for the heating maintenance crew . . . Proper planning, correct scheduling and follow-up are producing results at Martin . . . Value of various forms, Master Work Schedule and schematics

PRODUCTION shut downs, due to failure of heating systems, are costly and unnecessary. To eliminate these possibilities the Plant Engineering Department of our company applied an effective preventive maintenance program for its heating system. So effective did it prove that it has been applied to the Freon compressors, air compressors, and other equipment.

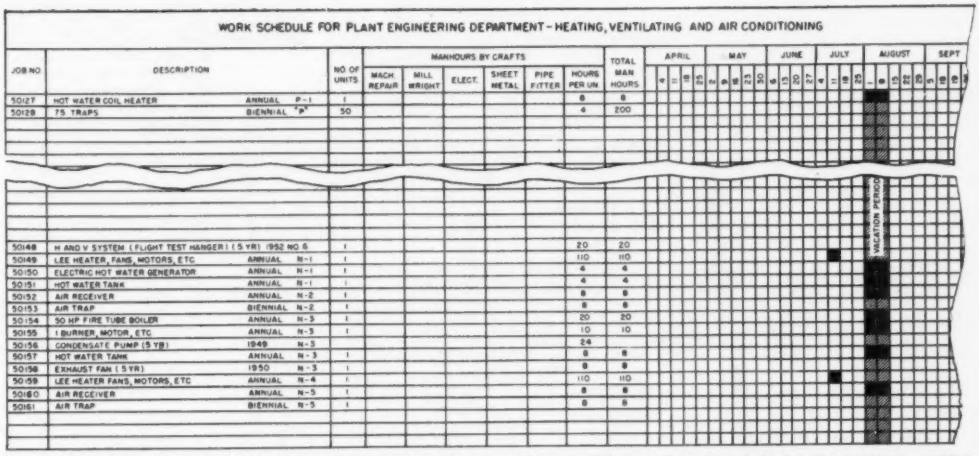
To illustrate what can and does happen without a PM program for the heating system: Suppose that investigation of trouble with one of the heater fans, two years ago, indicated a major repair to the fan but gave no indication of trouble with the rest of the heater unit. The fan trouble was corrected but the remainder of the unit was ignored. The following season the controls were not functioning properly and required constant attention, the pumps were operating but not efficiently, the burners required unusual attention, resulting in poor performance and excessive oil usage.

So last year we decided to inspect and overhaul, as a unit, the heater and all its auxiliary equipment. We got them back into shape and felt confident that this season would bring good results. However, the miles of duct work were overlooked and heating coils in the oil storage tank were not tested. The heaters were working properly, the controls functioning and the fans up to ca-

Fig. 1. Left: Cleaning oil burners is a seasonal chore. Maintenance man at left indicates oil burner motor shaft

Fig. 2. Below: Even the fuel oil storage tanks and its heating coils get their regular going over. Here a maintenance man breaks a union leading to the tanks

Plant Engineering
Preventive Maintenance Feature



WORK SCHEDULE FOR PLANT ENGINEERING DEPARTMENT - HEATING, VENTILATING AND AIR CONDITIONING

JOB NO	DESCRIPTION		NO. OF UNITS	MANHOURS BY CRAFTS: MACH. REPAIR	MILL WRIGHT	ELECT.	SHEET METAL	PIPE FITTER	HOURS PER UN	TOTAL MAN HOURS
50127	HOT WATER COIL HEATER	ANNUAL P-1	1						8	8
50128	75 TRAPS	BIENNIAL "P"	50						4	200
50148	H AND V SYSTEM (FLIGHT TEST HANGER) (5 YR) 1952 NO 6		1						20	20
50149	LEE HEATER, FANS, MOTORS, ETC	ANNUAL N-1	1						110	110
50150	ELECTRIC HOT WATER GENERATOR	ANNUAL N-1	1						4	4
50151	HOT WATER TANK	ANNUAL N-1	1						4	4
50152	AIR RECEIVER	ANNUAL N-2	1						8	8
50153	AIR TRAP	BIENNIAL N-2	1						8	8
50154	50 HP FIRE TUBE BOILER	ANNUAL N-3	1						20	20
50155	1 BURNER, MOTOR, ETC	ANNUAL N-3	1						10	10
50156	CONDENSATE PUMP (5 YR)	1949 N-3							24	
50157	HOT WATER TANK	ANNUAL N-3	1						8	8
50158	EXHAUST FAN (5 YR)	1950 N-3	1						8	8
50159	LEE HEATER FANS, MOTORS, ETC	ANNUAL N-4	1						110	110
50160	AIR RECEIVER	ANNUAL N-5	1						8	8
50161	AIR TRAP	BIENNIAL N-5	1						8	8

APRIL MAY JUNE JULY AUGUST SEPT

VACATION PERIOD

Fig. 3. This is a portion of one of the eight sheets which make up the Master Work Schedule for the heating, ventilating and air conditioning systems. Note that on this particular sheet much of the scheduled work falls in the vacation period. This period generally is reserved for work on items which are constantly in service

pacity, but certain areas still did not receive the necessary volume of heat. By failing to keep the ducts clean and to check and repair the leaks in the oil storage tanks we reduced heating efficiency and caused additional maintenance. This example shows the need for coordination and planning of maintenance schedules.

The need for *material* coordination is exemplified by the case of a Freon compressor opened for overhaul. Some of the worn parts needed replacement but they were unavailable. If suction or discharge valve discs and springs had been reworked valve breakage would have occurred before the next scheduled overhaul. This emphasizes the fact that it is practical to anticipate the need for such items as valves, wrist pins and bearings and similar wearing parts. Again, neglect in dehydrating a refrigerating system which has been left open for any period of time results in poor expansion valve operation, slugs of liquid, broken compressor valves and erratic performance.

In short as a result of such horrible possibilities and probabilities, a *PLANNED* preventive maintenance program at Glenn L. Martin has become a must for three basic reasons: 1. Operation costs require economical use of manpower and equipment and continuous effective use of controls; 2. Maintenance requires adequate planned outage time to make correct repairs at a minimum of cost; 3. Breakdown outages necessitating frequent emergency repairs would be costly and disturbing to plant personnel.

The maintenance program considers and groups equipment into three general classifications: summer, winter and year 'round use. Proper planning, correct scheduling and follow-up are producing restored, ready and reliable functioning of equipment and controls whenever needed.

From May 15 to Oct. 15, general plant heating systems are serviced and overhauled; this includes fuel oil systems. The major portion of the plant is heated by 35 large warm-air furnaces, varying in size from 1,500,000 to 5,500,000 Btu output. These furnaces are cleaned and serviced annually, some of the burners being completely overhauled. All condensate pumps, fuel oil pumps and auxiliaries that are scheduled for overhaul receive attention during this period.

Boilers and pressure vessels, such as air receivers and hot water coil heaters, are serviced and prepared for annual insurance inspection. Necessary outages can be arranged with the manufacturing departments. High tension substation switch gear and circuit breakers are inspected and serviced annually, usually during the plant vacation period. Other equipment on year 'round use, such as air compressors, steam distribution lines and reducing stations, are scheduled for overhaul at varying intervals as dictated by experience, which has been translated into a Master Work Schedule, one sheet of which is shown in Fig. 3.

From June 1 to Sept. 1, all office heating systems are scheduled for overhaul and necessary service. Units such as traps, strainers and by-pass valves are overhauled every two years; Their condition is an important factor in holding steam consumption to a minimum. But, it has been found that heating control sys-

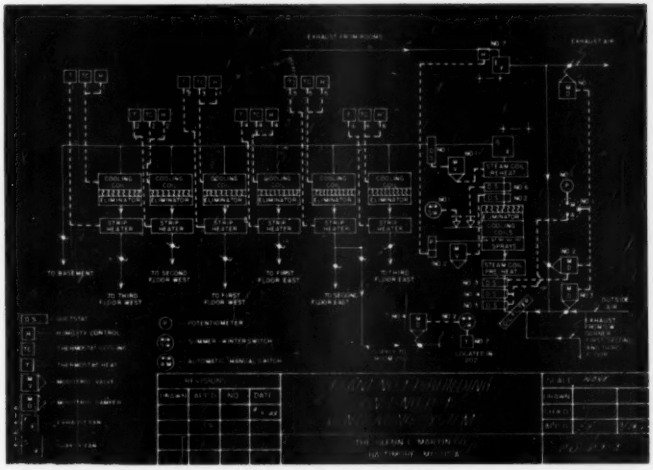


Fig. 4. This is a typical ventilating and air conditioning system in the Martin plant. There are 25 such systems, varying in size from 3 to 300 ton capacity

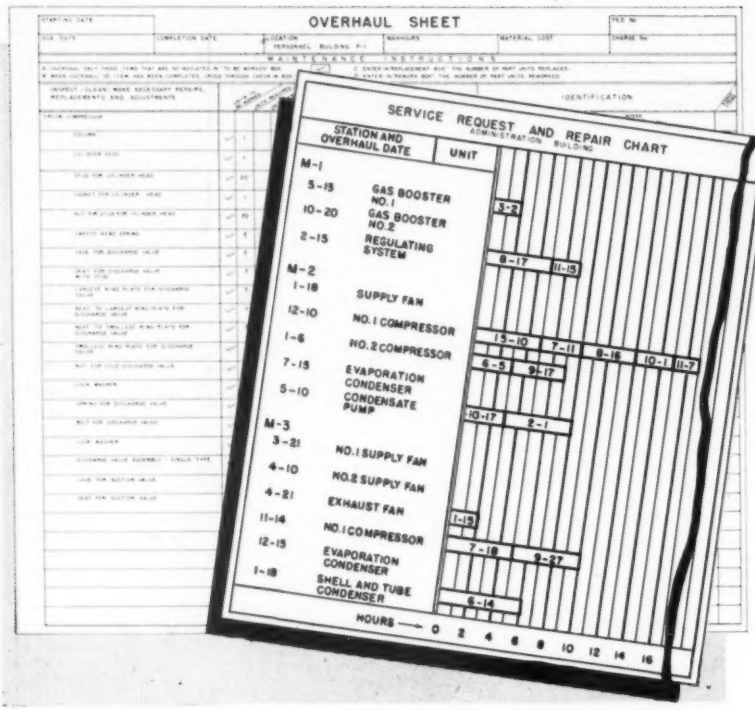


Fig. 5. Left: The Overhaul Sheet is closely allied to both material coordination and work coordination. It indicates, not only the work to be done but also shows the parts necessary to accomplish the overhaul and thus insures that these parts will be on hand when the job is to be done. Fig. 6 Right: The Service Request and Repair Chart permits the development and flagging of frequent service and repair to systems. Analysis of this chart affords the plant engineering department a check against poor repair work

tems can be serviced too frequently. They often become temperamental in their coordination with other controls of the system.

To offset this, and to obtain unified purpose and control, an overhaul of the entire system is scheduled to take place approximately every five years. To guide both the operations and maintenance units in this work, a schedule of station control requirements with schematic drawings and wiring details is posted at each machine room. This arrangement has overcome confusion, stopped individual interpretation of control uses and settings, and contributed much toward eliminating employee dissension.

Approximately twenty-five air conditioning systems, varying in size from 3 to 300 ton capacity are serviced and overhauled as called for in a Master Work Schedule in the period from Nov. 1 to Mar. 15. These systems are of the direct expansion type, using Freon 12 as refrigerant. The accompanying schematic control diagram, Fig. 4, presents a typical layout.

Maintenance of air capacity can be affected adversely as follows: 1. By improper action or sequencing of motorized dampers controlled by ductstats; 2. By packing of the self-cleaning oil filter, gradual accumulation of dirt on preheat coils, cooling coils, reheat coils or any zone booster cooling and reheat coils.

Readings taken at test holes, to determine static pressure difference between a clean system and a dirty system, have shown that cleanings are required approximately every five years. Cleaning of supply and exhaust grills should be accomplished as regularly as necessary to maintain a clean appearance in the areas served. Work on this part of the system is scheduled for the spring of the year and accomplished on the second and third shifts so as not to interrupt use of the ventilating system.

Other major items in the PM program are the supply and exhaust fans. These units should be checked for bearing and sheave wear either of which reduces fan capacity. Mechanical overhauls to Freon compressors, pumps, motors, exciters, controls, unloaders, evaporative condensers and shell tube condensers—which are housed inside—are scheduled during cold inclement weather. October equipment is scheduled for inspection and overhaul in the early spring of the year. Use of chemical compounds in the water, during the operating season, has eliminated expensive descaling of evaporative condenser and shell and tube condenser coils.

To control operation, overhaul, servicing and use of these systems and equipment the following forms are used: I. Master Work Schedule (Fig. 3); II. Standard Procedure, the subdivisions of which are— a. Operating Instructions, b. Control Functions, c. Station Requirements and Settings, and d. Operating Schedule: III. Systems' Schematic and Detail Diagrams (Fig. 4); IV. Overhaul Request Sheet and Renewal Parts Listing (Fig. 5); and V. Service Request and Repair Chart (Fig. 6).

The use of the forms noted under Items I, II and III have been explained. The Overhaul Sheet (Item IV), is a check sheet which can be used for a repair or complete overhaul as marked. It indicates the detail work to be done. It also lists the parts necessary to accomplish an overhaul or repair, and insures that necessary parts are available at the time the work is scheduled. Item V is a highly important Form. It develops and flags frequent service and repair to units or systems. Analysis of this chart affords a positive check, resulting in real control of overhaul frequencies and the spotting of poor repairs.

THERE IS no known material that will completely confine magnetism. But a sheet of iron of sufficient thickness, placed near a magnet, will act as a magnetic shield, according to a magnet specialist in one of the larger electrical manufacturing companies. "The magnetic lines of force are diverted through the iron and do not reach beyond," he points out.

(Continued from page 28)

concentrated warm solution of neutral soap.

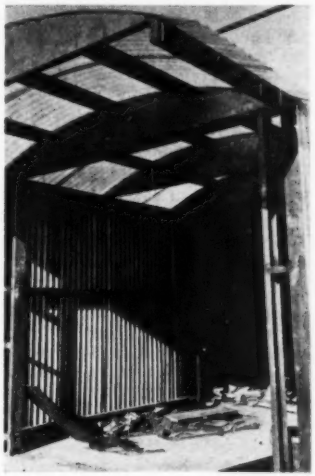
Occasional waxing accents the colors of the tile, and only water-emulsion wax should be used—never a wax containing solvents like turpentine and benzine; nor should varnishes, lacquers, shellac or other plastic finishes be used. For a high, lustrous sheen, several light coats of wax are applied and each coat buffed after drying thoroughly.

Any resilient floor, including hardwood, is scarred and dented by furniture indiscriminately moved on it or allowed to stand on it without protection from legs or bases. All bearing or contact areas of furniture or equipment resting on the floor should be smooth, flat and free from small projections, recesses, holes and roughness. The contact surface should be large enough to distribute weight over a large area, with edges rounded to prevent cutting action if momentarily turned on edge.

"In Light, Out Rain" Plant Entrance

Contributed by
Owens-Corning Fiberglas Corp.

THE PROBLEM of how to provide adequate and economical lighting in large industrial structures is an old one. The National Tank Co. of Tulsa solved it neatly by the use of translucent Fiberglas and plastic sheets for the skylights and windows. The material was worked the same as any building material—sawed, nailed, punched and fastened. For weatherproofing of lap joints, a special translucent mastic was used.



Covered entrance to mill building of National Tank Co. plant has translucent roof of Fiberglas and plastic sheets

They Burn Fluorescent Tubes

Contributed by
Frank Allen, Supt. Maint.

WHEN WE were first informed of the danger of broken fluorescent tubes, we tried various methods for their safe disposal, and finally hit on the idea of burning them in our boilers. We throw two or three at a time on the fire where they completely disintegrate in a very few minutes, and the small quantity of poisonous dust is dispersed through the chimney. We wait then for the matter of an hour or two before burning any more so that at no time would there be the slightest possibility of concentration of any poisonous matter. We have used this method for about a year and have found it very effective.

Questions and Answers

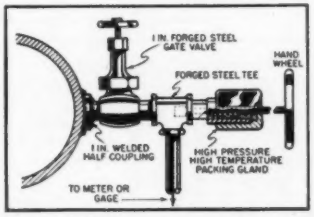
How To Make Orifice Cleanouts

Submitted by
J. Wharton

CAN YOU give me a sketch or directions on a simple, fool-proof type of orifice tap cleanout rod or drill?

Contributed by
Geo. A. Larsen

THE ACCOMPANYING sketch is just about self-explanatory and, we believe, will fill the bill. We have used it on flow meter installations at this refinery with complete success. For flange taps you should use ½ or ¾ in. connections. The size of the tap connection will be determined by the flange weight.


1 IN. FORGED STEEL GATE VALVE
HAND WHEEL
FORGED STEEL TEE
1 IN. WELDED HALF COUPLING
HIGH PRESSURE HIGH TEMPERATURE PACKING GLAND
TO METER OR GAGE

Typical orifice tap cleanout rod or drill as suggested by Mr. Larsen

Refrigeration Men—Help, Help!

Submitted by
F.L.S., Cincinnati

WE HAVE a small distillation plant consisting of a deodorizer and a distillation column with supplemental heat exchangers, condensers and receivers. The volume of these units is about 2000 cu. ft. The plant operates at 10 mm Hg, absolute pressure. We have been plagued with loss of vacuum because of leaks in the joints. Our procedure has been to shut down, blank off the barometric legs of a three-stage ejector type of vacuum unit, apply 15 psi air and use a soap solution on all the joints.

Can anyone suggest a quicker method perhaps by use of Freon, ammonia or other gas by which the leaks can be determined quickly, safely and economically? What would be the cost of making one system charge of a recommended gas?

Wants to Remove Tar From Wood Floor Blocks

Submitted by
H. H. McC., Newark, Ohio

DO YOU have any information on a method for removing coal tar from wood blocks? We have a large quantity of these blocks which were removed during the installation of additional equipment in the plant. We want to store them but first we want to clean them so they will be ready for instant use.

Wants to Pump Some Molasses

Submitted by
V. L. G., Buffalo, N. Y.

PLEASE inform me how high a good steam pump could lift molasses with a temperature of 40 F. (Reciprocating pump, we assume.—Ed.)

This molasses weighs 12 lb per gallon 45 Baume 86 deg Brix.* I do not know the viscosity at 40 F. I know it moves very slowly so the viscosity is very low at that temperature.

Do you know of any formula on how to figure the possible lift of molasses at different temperatures, also the discharge pressure necessary to deliver 400 gal of that molasses through a 10 in. pipe line 200 ft long at different temperatures?

* The Brix scale is an arbitrary scale for direct conversion of the reading of a saccharometer, which measure the amount of sugar in a solution, into its specific gravity. It is well known to chemists in this field.

(Continued from page 18)

should next be flushed. For this purpose, a valved hose is connected, discharging through a window.

Finally, inspect the intake screen of the fire pump to make sure that mud, gravel or other debris will not be sucked in, as such material can plug the impellers of pumps and obstruct the sprinkler system. *From Factory Mutual Record, a publication of the Factory Mutual Fire Insurance Companies, Boston 10, Mass.*

Crane Work Life Increased by Flame Hardening

THE LINE of power cranes and shovels, manufactured by the Thew Shovel Company of Lorain, Ohio, are mechanical testimonials to the oxyacetylene process of flame hardening.

In this flame-hardening application the triple torch set-up, using Style 4383 torches and specially designed tips, permits the simultaneous hardening of three sheaves. By thus treating only the desired area, they were enabled to localize the hardness where needed. This leaves the balance of the sheave ductile enough for proper machining. Generally, to obtain any appreciable degree of hardening, the material treated must be of such chemical composition as to respond readily to heating and quenching. For carbon steels, the carbon content must be at least 0.35 per cent. Cast and malleable irons of suitable composition may also be satisfactorily flame-hardened. *From Airco in the News, a publication of Air Production, 60 E. 42nd St., New York 17, N. Y.*

Take the Kinks Out of Pipe Alignment for Butt Welding

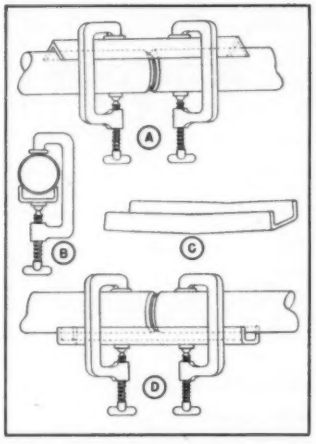
WHILE ANGLE IRON is often used to align ends of pipe for butt welding, it is a problem to get C-clamps to stay on. Even when the clamps are notched, two men are required to make the assembly. A better method is to use one piece of channel and two C-clamps.

The pipe ends should be free of burrs, preferably chamfered. The channel should be of such a size that the pipe rests on the flanges only, not striking the web. With the flat web of the channel, there is not the danger of slippage as when an angle is used.

In assembling the set-up, a piece of welding rod placed between the pipe ends before tightening the second clamp, and then removed, gives proper spacing between pipe ends, assuring good penetration. Once the set-up is assembled, the welder may either weld halfway around before removing the channel, or tack weld securely.

One man can easily attach the ordinary C-clamps and channel iron. Notching the jaws of the clamps is neither necessary nor desirable. One word of caution to the uninitiated: If the channel becomes red hot, as is likely when a torch is used, it will bend upon cooling and be useless for making straight alignments.

Most plants will have in the scrap pile old pieces of channel of proper sizes to fit different sizes of pipe. If not, the convenience and time-saving will justify the purchase of an assortment of pieces of 2- or 3-ft length. *By Alfred W. Gould, in the Aug., 1949, issue of Power Generation, a publication of Technical Publishing Co., 53 W. Jackson Blvd., Chicago 4, Ill.*



A—When an angle iron is used for aligning pipe ends for butt welding, it is difficult to avoid slippage of the clamps. B—Note how the clamp fits squarely against the flat back of the web when a channel is used. C—When the channel is heated red hot during welding, it will bend upon cooling, becoming worthless for aligning purposes. D—The size of the channel should be such that the pipe rests on the flanges only, not touching the web

Automatic pH Control Regulates Acid Waste Neutralization

AT THE NEW PLANT of an electrical goods manufacturer in the east, industrial wastes are automatically neutralized for safe discharge into the Lehigh River.

About 80,000 gal of wastes are handled daily, consisting of spent plating baths, pickling solutions and caustic dips. These solutions are predominantly acid. In a 48,000-gal settling basin the suspended solids fall out. Wastes are then piped through an overflow line into an 8000-gal reaction tank to be neutralized with a 10 per cent solution of caustic soda. A sample of the reaction tank solution is pumped through a glass-electrode assembly, which continuously detects the pH of the mixture. Leadwires from the assembly run to a Micromax pH controller which automatically records pH and controls the feed of caustic solution, maintaining a pH concentration of 7, the point of neutrality. *From Modern Precision, a publication of Leeds and Northrup Co., Philadelphia 44.*

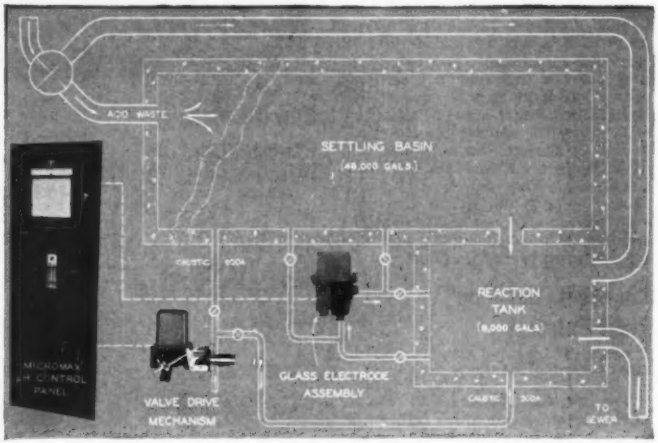


Diagram of pH control as applied in this company's waste disposal system

"Dead" Truck Batteries Need Not Be a Dead Loss

INDUSTRIAL TRUCK batteries which have reached the end of useful life in the service to which originally applied can nearly always be successfully reapplied to some other kind of work having lighter power demands.

In applications such as power supply for telephone or auto-call systems, the work is usually so much lighter than industrial-truck service that the capacity of almost any retired truck battery is likely to be more than ample. Sometimes it is necessary to regroup the cells into batteries of either fewer or more cells in case a lower or higher voltage is required. In the latter case, of course,

cells from more than one retired battery are needed.

Recently a case was noted where a 22-cell A6 battery, retired from industrial-truck service, had been reapplied to a motor-testing operation. All in all, the battery had been in service a total of 26 years. One railroad has in effect a systematic procedure for reapplying air-conditioning and car-lighting batteries after they have dropped to 80 per cent of their rated 5-hour capacity. Such batteries are assigned to other cars having smaller load demands. *From Storage Battery Power, a publication of Edison Storage Battery Division of Thomas A. Edison, Inc., West Orange, N. J.*

New Grease Resists Both Heat and Water

ALTHOUGH the use of grease dates back 3300 years, it was not until after the drilling of the first oil well in 1859 and the introduction of high-speed machinery that any progress was made in its manufacture. The 49'ers crossed the continent in Conestoga wagons lubricated with the same kind of grease used by the Romans on their chariots in 1400 B.C.

Not many years ago 600W was a general lubricant used for all heavy duty applications. Later two general types of grease were developed, blended with either lime or soda base soaps. Lime base soaps resist water, but fail under heat. Soda base soaps resist heat, but are washed away by water.

After years of experimentation, chemists finally accomplished what had been considered the impossible by producing commercially a barium soap grease with both heat- and water-resistant qualities. One interesting industrial application was in a Nevada smelter where a conveyor moved blister copper from a high temperature furnace through a water bath cooler. The new barium soap product cut lubrication costs 75 per cent and increased the service interval from twice daily to every four days. *From The Minute Man, a publication of Union Oil Co. of Calif., Los Angeles 14.*

Up to Seven Coats of Paint Removed by Sandblasting

RECENTLY a fifth floor was added to a plant office building which had been built piecemeal: first two floors in 1908, third and fourth floors in 1913, and a four-story wing in 1930. The entire structure was to be refinished in white oriental stucco, which necessitated removal of paint, seven coats thick on the oldest part of the structure.

Sandblasting was employed, the operator working on a movable scaffolding to cover the 7000 sq ft of wall area of the 52-ft high, 125-ft long building. A pure silica Grade No. 1 sand was used because of its extreme hardness and sharpness. The supply tank at ground level had a capacity of 700 lb and was refilled two or three times a day to supply the required 9 lb of sand per sq ft of surface, which was cleaned at an average rate of 200 sq ft per day. Sand was applied with air at 100 psi through a 1-in. ID hose and ¼-in. steel nozzle held about 6 in. from the wall. Abrasion required replacement of the nozzle every three or four hours. The operator's helmet was supplied with 15 cfm of fresh air through a ⅜-in. hose.

After removal of paint the building was washed down with a weak solution of muriatic acid, and this was followed by thorough rinsing with clear water to rid the walls of the fine dust clinging to them. *From Vol. 54, No. 8, of Compressed Air Magazine, Phillipsburg, N. J.*

Hope to Distill 2 Million Gallons Sea Water Per Hour

WATER shortages are acute in many areas of the West today. Hundreds of thousands of acres of irrigated land are being kept in production only through serious overpumping of the existing ground water.

Between 1940 and 1947 the Los Angeles, San Diego, and San Francisco-Oakland metropolitan areas of California increased in population from 4,265,000 to 6,380,000. Estimates forecast a population of 8,250,000 for these areas in 1960.

Of several possible methods of increasing the water supply, distillation or other purification of salt water offers the advantage of having an unlimited source in the Pacific Ocean.

Distillation of fresh water from salt water in fairly large quantities has long been a practice aboard ship, both for boiler-feed water and for personal use. During World War II the Navy Department urged manufacturers to develop distillation units for use on South Pacific islands affording little or no fresh water for troops.

The most efficient of these units were capable of producing 250 gal of fresh water per hour through fuel consumption of 10 to 12 gal of Diesel oil. Within the past six years research has continued, and today several companies are manufacturing vapor-compression distillation units varying in rated capacities from 60 to 4,000 gal per hour. It is estimated by the manufacturers that the largest of these units will operate on a fuel ratio of approximately 200 to 1, and that the cost of distilled water produced, including depreciation, fuel, cleaning and all other operating costs might be as low as $0.55 to $1.55 per 1000 gal.

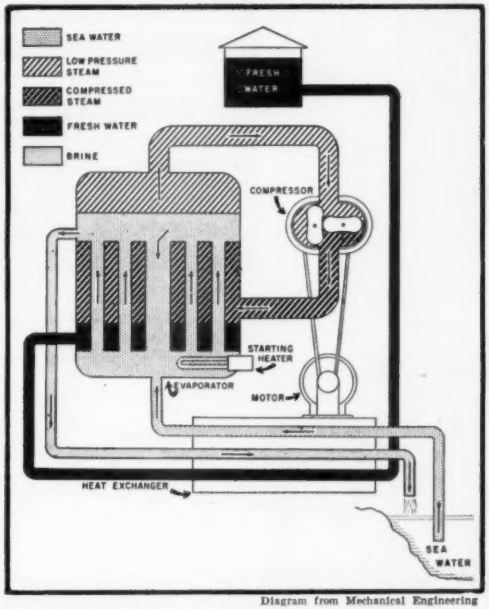


Diagram from Mechanical Engineering

Vapor-compression of sea water. Raw enters by way of a heat changer, which extracts heat from outgoing distillate and brine to heat feed water coming in, which then goes to the evaporator. Steam at atmospheric pressure goes to the compressor, which raises the steam pressure to about 3 psi, raising its saturation temperature to about 222 F. Circulation in evaporator causes boiling and evaporation of brine and condensation of steam, the condensate passing through the heat exchanger where it is cooled and discharged as fresh water

This is still too high for municipal or irrigation use, except in emergencies. Similar bills introduced into the Senate and House of Representatives would enable the Secretary of the Interior, through the Bureau of Reclamation and other agencies, to authorize research and to construct, maintain and operate one or two more demonstration plants producing distilled water from sea water on a scale suitable for municipal or irrigation use.

The problem being confronted is to develop distillation plants with 500 times the capacity and 50 times the efficiency of the largest units manufactured today. *From an article by Oscar L. Chapman, Undersecretary of the Interior, in the August issue of The Reclamation Era, a publication of The Bureau of Reclamation, United States Department of the Interior, Washington 25, D. C.*

MODERNIZATION *Demands...*

G-E Motor Control Centers

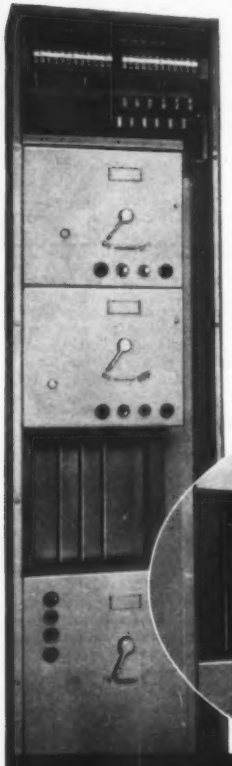
for EASY, LOW-COST INSTALLATION

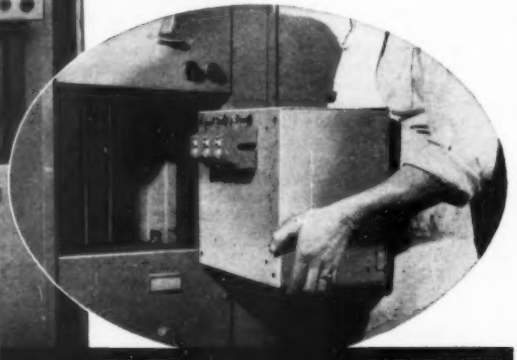
FLEXIBLE ARRANGEMENT

SIMPLIFIED SERVICING

These advantages, plus many more, are yours when you buy economical, G-E motor control centers. Only 12 inches deep, front connected, pre-engineered, can be factory assembled, wired, and tested. Individual sections can hold combinations of two or more sizes of starter units. (NEMA Size 1, 2, 3, and 4 for 1 to 100-hp a-c motors, 440 volts or below). Standard starters in standard vertical sections simplify installation, servicing, and stocking spare parts, yet permit flexible arrangements.

In addition, each unit is "wrapped in steel," has built-in short-circuit and overload protection. Wiring troughs are five inches wide, terminal and incoming bus may be at top or bottom as you prefer—all easily accessible. Wiring time is cut because "clothespin contacts" (below) connect to incoming power in one quick shove. Write now for more details in Bulletin GEA-4979. *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*





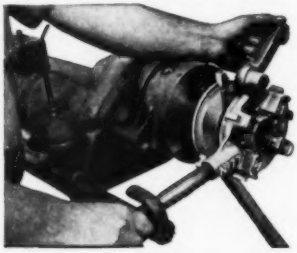
GENERAL ELECTRIC

New Products and Methods

(Continued from page 20)

to center pipe instantly and assure straight threads.

When the thread is completed, the dies are released by opening a throw-out handle and the tool lifts off. This is to eliminate "backing off" over the finished threads.



When the throwout handle is closed, the dies are automatically reset to size. There are 186 different kinds and sizes of dies available for use with the No. 77. Beaver Pipe Tools, Inc.

9—DYNAMOMETER

Of 30 to 300 ft-lb capacity, for load testing large motors

This Model SA-484 is placed directly on the test floor, and is provided with jack screws for raising it to the correct height for connection to the motor to be tested, which is secured to a bedplate, subbase or rails. Adapters for 1⅛ to 2⅞ in. motor shafts are furnished with dynamometer. The 0

to 300 ft-lb laboratory test gage and foot control cylinder for operating the dynamometer can be placed in the most convenient positions.

Tests that can be made include idle, pull-in, pull-up, full-load and locked. The locked test can be made without having to shut off the motor to insert a locking pin or similar device. The dynamometer can not be used to make a heat run on a motor, it is pointed out. Built to order only. Wagner Electric Corp.

10—SUB ZERO DETERGENT

For clean-up jobs around meat-packing and locker plants

Santomerse No. 1, a synthetic organic detergent and wetting agent is said to remove fruit stains, blood, fatty particles and other proteinaceous material at temperatures below zero. Alone, or in combination with "builders" it has been used as a general purpose cleaning agent. Described as extremely stable in acid and alkaline solutions, Santomerse No. 1 functions in hard or soft water, and is credited with markedly retarding growth of mold and bacteria.

It is its ability to function in salt water that makes it an effective locker plant cleaner, according to manufacturer, who states that a brine solution of 2.5 lb of salt and 2 oz of Santomerse No. 1 per gal will clean interiors of individual food lockers at -4 F. This is intended to elimi-

PLEXIGLAS *diffusing panels in control room of Philadelphia Electric Company generating station. Large sections of white translucent* PLEXIGLAS, *installed below cold cathode tubes, give excellent glare-free illumination.*

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Actually, white translucent PLEXIGLAS diffuses light so completely that shadows and glare simply vanish. Minimum absorption and maximum transmission of light give full, even illumination throughout any room. Brightness ratios are remarkably low.

PLEXIGLAS ¼" thick has seven times the impact strength of glass—yet weighs less than half as much. Light weight and shatter resistance permit its use in large sections with complete safety and ease, and economy of installation. Maintenance costs are negligible.

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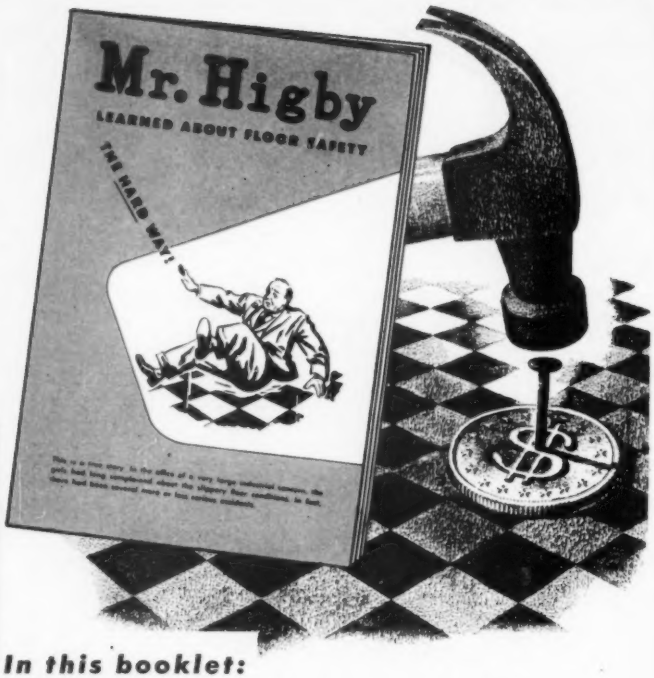

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for the most looked-at part of your plant

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Area_____sq. ft. PB-9

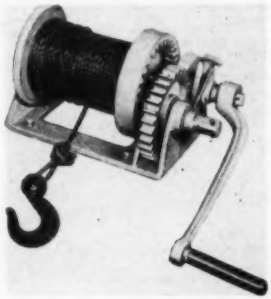
LEGGE SYSTEM
of Safety Floor Maintenance

nate the need for defrosting, while the germicidal and deodorant action of the solution leaves lockers fresh and sweet. Monsanto Chemical Co.

11—PORTABLE HAND WINCH

Is especially suited for moving heavy objects in confined areas

This useful winch comes in two sizes: a 1500 lb capacity model, having gear ratio



of 8.16 to 1 and 3 to 1 gearing, and a 500-lb model having 3 to 1 gearing. Both are made of electric cast steel with moving parts of bronze bushings, and equipped with wire rope and goose neck hook. Gold Foundry and Machine Works.

12—PACKAGED SPEED DRIVE

Is adjustable electronic unit for providing stepless control

Mot-O-Trol packaged speed drive, is intended to provide a wide, stepless range of speed control for d-c motors from a-c sources. It is designed to start motors, bring them up to a pre-set speed smoothly and rapidly, permit change of speed at any time, apply dynamic braking for stopping, and reverses motors. A feature of the drive is the sub-assembly construction of the unit; sub-assemblies can be removed for easy maintenance.

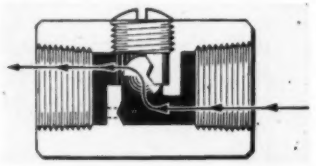
A single dial is provided for finger-tip control of the motor throughout entire speed range. Speed may be pre-set before the motor is started, or it may be changed after the motor has come up to speed. Once speed is set, Mot-O-Trol drive automatically maintains close speed regulation to full speed, according to manufacturer, and improved IR drop compensation provides a nearly flat speed-torque characteristic over entire speed range. This compensating circuit is controlled by feedback from armature current. Westinghouse Electric Corp.

13—SPEED CONTROL VALVE

For air or hydraulic cylinder speed control

This valve is designed to provide more accurate control of cylinder speed as well as unrestricted flow from the cylinder. It is claimed to assure greater efficiency and full use of air or hydraulic cylinder power by eliminating abnormal pressure of the exhaust from the return side of the cylinder, increasing the cylinder effective power pressure with spring loaded checks.

When the flow is to the cylinder (in either direction) the ball check instantly



closes and the flow path is directed through the flow control valve, which has a wide range of adjustment, according to manufacturer, and reverse flow from the cylinder is unrestricted because the unloaded ball check opens wide on a slight change in pressure.

Another feature emphasized is compact size to permit compact piping arrangements. Valve is made in $\frac{1}{4}$, $\frac{3}{8}$ and $\frac{1}{2}$ in.

pipe sizes from brass hexogon roll bar stock, all other parts are stainless steel. Pneu-Trol Devices, Inc.

14—SMALL LATHE

Has large "through-the-spindle" capacity, is moderately priced

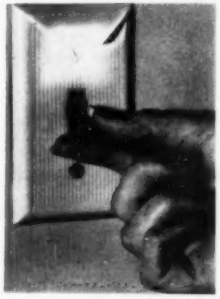
Here's a 10-in. swing lathe with a 1⅜ in. hole through the spindle. According to manufacturer, it was developed for plants that need large collet capacity but are restricted as to budget or floor space. Features of the lathe include large preci-

sion roller bearings; a four-speed (eight spindle speeds) V-belt underneath motor drive; double-walled, worm feed apron; quick-change gears; enclosed headstock with hinged cast aluminum cover, and standard operator controls. Known as the "XL" series, the lathe will come with 38 or 44 in. bed length on a three-drawer steel bench, or with pedestal base in bed lengths up to 62 in. Sheldon Machine Co., Inc.

15—LIGHTED SWITCH PLATES

Have tiny neon glow lamps which show up in the dark

Lighted wall switch plates are a means of reducing the hazards and inconveniences of groping for light switches in the dark. The small lamp used in them, the NE-2, produces a soft glow behind a plastic shield at the top of the plate. It lights automatically when room lights are turned



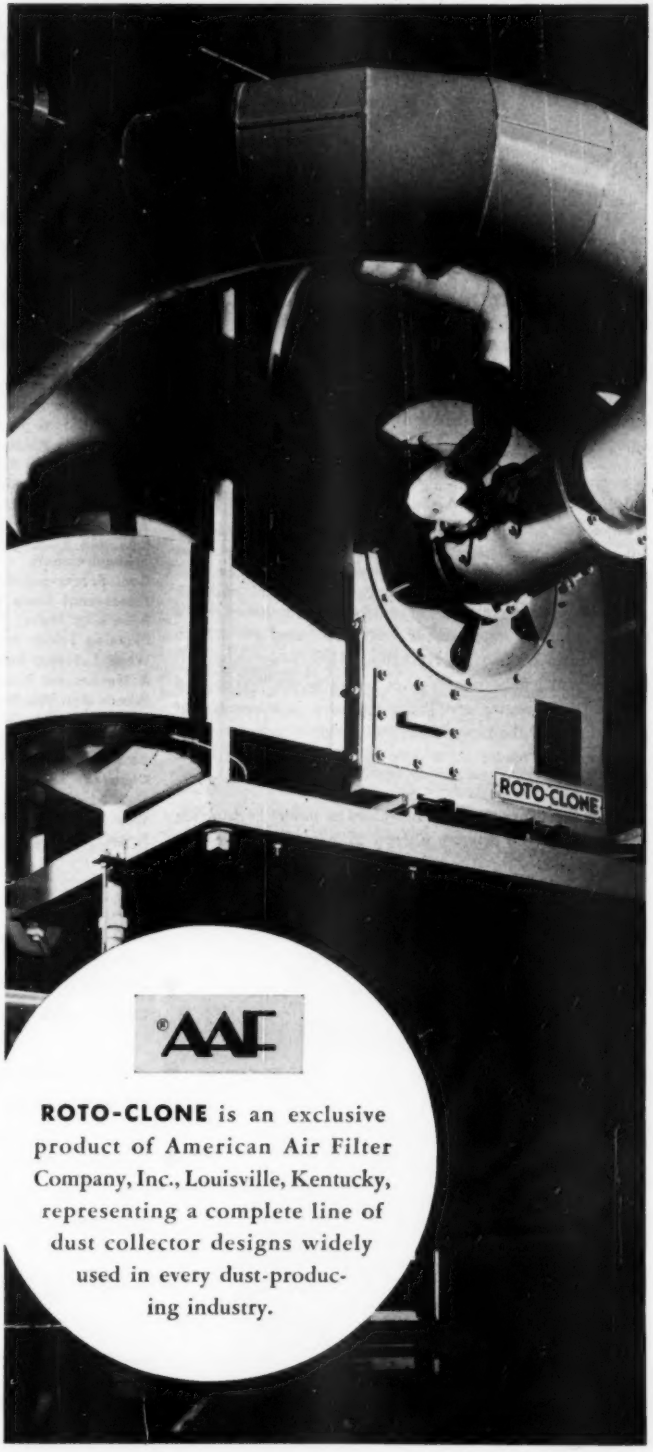
off and goes off when lights are turned on. The NE 2 is said to have a burning life in excess of 25,000 hr and to consume only about a penny's worth of electric current a year. The lighted switchplates are also credited with reducing smudging of walls near the switch. Lamp Department, General Electric Co.

16—HEATING SYSTEM

Is designed to increase output from steam heated equipment

The Quik-Temp system of heating and drainage is described as a production tool for increasing output from almost any type of steam-heated machines or equipment. It consists basically of an accumulator (Model 848 shown) into which most units in the machine group drain. Air and condensate and steam collect continuously in the accumulator, which periodically and automatically discharges condensate air to existing return line. Steam from accumulator operates one or two

(Continued on page 56)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(Such subjects are the very life-blood of power engineering but of little or no *primary* interest to plant engineers)

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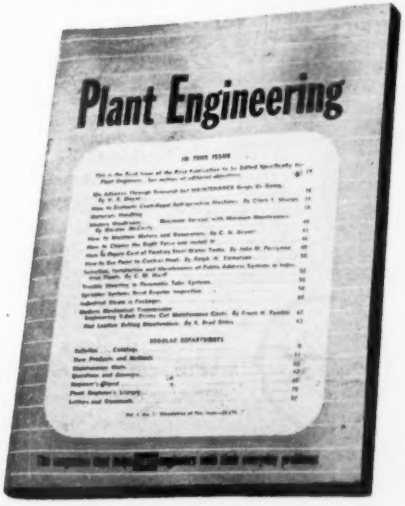
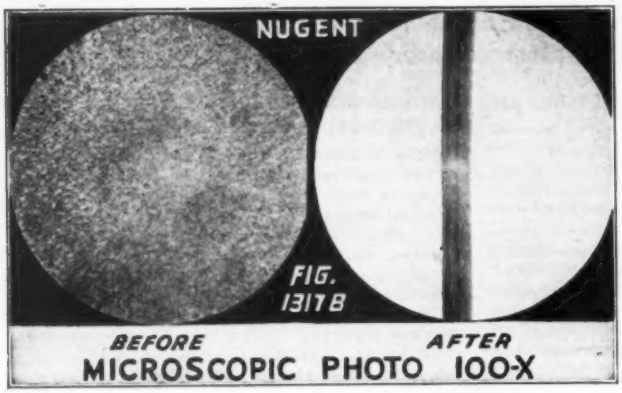


53 W. Jackson Blvd. Chicago 4, Ill.

Can your filters match this cleaning power?



NUGENT
ABSORBENT OIL FILTERS
GET 99.8% OF THE DIRT!

The "before and after" photomicrographs reproduced above are positive proof of the ability of Nugent Filters to keep dirt out of the vital working parts of your equipment. And just to give you an idea of the magnification in this view, the dark line running vertically through the "after" picture is a human hair (.0025" dia.)!

Carefully controlled tests under operating conditions show that Nugent Absorbent Filters will get 99.8% of the dirt! Translated into benefits for you this means longer life and less maintenance for your equipment and substantial savings in oil.

There is a Nugent Filter of the proper size and type to meet your requirements. Write today for complete data.

Wm. W. Nugent & Co., Inc.
430 N. Hermitage Ave. CHICAGO 22, ILLINOIS

OIL FILTERS, OILING AND FILTERING SYSTEMS, TELESCOPIC OILERS, OILING DEVICES, SIGHT FEED VALVES, FLOW INDICATORS

Established 1897

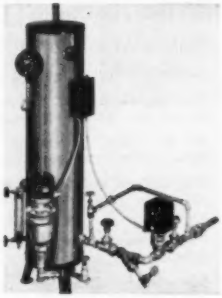
Representatives in Boston • Cincinnati • Detroit • Houston • La Junta, Colo. • Los Angeles Minneapolis • New Orleans • New York • Philadelphia • Portland, Ore. • San Francisco Seattle • St. Louis • Tulsa • Representatives in Canada: Montreal • Toronto • Vancouver

New Products and Methods

(Continued from page 53)

units in the machine group. Other components include a metering unit installed on each machine, and automatic control equipment.

Quik-Temp will permit boiler to heat steam, manufacturer points out, using equipment from cold to operating temperature almost instantly and keep it hot almost regardless of load change. Surface



temperature of all machines are held at a constant peak, temperature level, it is said, assuming only a constant steam supply pressure. Variations in speed of operation or type of load are said to have little effect on individual machine performance. Fred H. Schaub Engrg. Co., Inc.

17—PLASTIC SPRAY
For protecting metal, wood, paper and leather surfaces

Maintenance work is reduced through the use of Plastic Coat, described as a non-corrosive Bakelite polyethylene spray developed to give a clear, glossy, flexible finish to a wide variety of surfaces. To use, merely press the top of the container. Plastic Coat is said to provide protection against water, alcohol, oil and grease, alkalis and corrosive and tarnishing elements. It dries in about 2 min.

Plastic Coat is particularly useful in preventing tarnish and protecting the polish of brass, bronze, and chrome, according to manufacturer. It also provides a durable and protective coating for drawings, tracings, blueprints, maps and photographs. Can be used outdoors, too. Retails for $2.95 for 12 oz container. Bridgeport Brass Co.

18—ALARM SILENCER
Is intended to eliminate manually opened alarm circuits

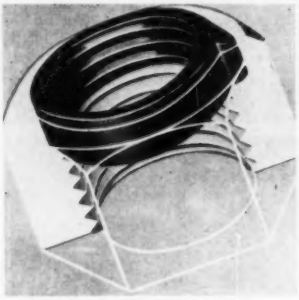
To eliminate the danger of forgetting to close hand opened knife switches in alarm circuits, a new Autocon Alarm Silencer, Type ABS may be used with any type electrical alarm circuit that indicates emergency conditions such as pressure, liquid level, temperature, smoke, gas overload.

It is designed to provide continuous, complete protection even though warning sound is stopped. When emergency condition arises, the alarm is stopped by pressing button on side of case. A glowing red light remains on until trouble is corrected. When circuit is clear, the Autocon Silencer automatically resets itself and the light goes out. Automatic Control Co.

19—LOCKING NUT

Is made to lock securely in any position on threaded part

Positive locking, exact adjustment, quick application and economy are features claimed for the Security Locknut. It consists of a standard steel nut and a slightly elliptical retainer ring combined in a single unit. When applied, the bolt is said to force the retainer back into circular



shape, causing retainer to grip bolt threads with high pressure and prevent rotation of nut even under conditions of severe vibration.

Manufacturer says automatic locking of the nut on the bolt doesn't require bolt tension; it stays where it is positioned by wrenching. The nut can be applied in either direction. When retainer grips the bolt on which the nut is applied, bolt load or stress is borne entirely by the nut.

Position of nut on threaded portion of bolt or other threaded part can be readjusted at any time, and nut may be removed and reapplied. Locknuts are made with National coarse and fine threads in standard sizes from $\frac{3}{8}$ to $2\frac{1}{2}$ in. Security Locknut Corp.

20—MERCURY CLEANER

Is developed to clean metal-contaminated mercury for re-use

The Mercury Oxifier is designed to require little attention and cost no more to operate than the electric current charge for running the apparatus motor. It consists of a glass drum into which the mercury is poured, with an agitator, electric motor, and receptacle to hold the clean mercury. Normally the operator simply lets the agitator run several hours.

The agitator beats the mercury into a thick spray to provide air contact. As mercury is agitated, any metals which oxidize

form skins and as these are broken up, nothing is left but powdery and noncohesive oxide, readily separated from the clean mercury beneath.

Thus, after being agitated, the mercury is poured off and held long enough to allow oxide particles to rise to the surface; then, after filtering, it is ready for use. It is pointed out that where physical dusts, oils or greases adhere to surface, manufacturer's Type F "gold-adhesion" filter removes them in a few minutes.

After treatment the mercury is said to be suitable for use in the McLeod gages, manometers, displacement devices. Apparatus handles batches up to 25 lb with residual contamination of less than 1 ppm.

Rugged tools . . . . twice as strong as you would expect such slim, streamlined handles and thin-walled sockets to be.

"The Choice of Better Mechanics"

Mechanics like this set because it is way over par in performance . . . the tools are strong and easily adaptable to a variety of jobs.

They squeeze into tight places and get those hard-to-reach nuts and bolts that defy the ordinary type wrench. Recently designed by Snap-on engineers, they have the new features that make fast, easy work of the tough jobs.

INCLUDED IN THE SET: 1/4" and 5/16" single broached sockets; 11 double broached sockets from 3/8" to 7/8"; a speeder wrench, sliding tee, 8" reversible ratchet, nut spinner and universal joint, plus a 3", 6" and 12" extension. All complete in a metal box for only **$27.65**

Present Owners — *Supplement your present set with these special Ferret tools . . . . .*

CLUTCH-TYPE SCREW DRIVER
Handles clutch-type (figure 8) head screws. Built short for easy operation in close quarters.

RATCHET ADAPTOR
Converts any combination of Ferret handle, extension and socket into a reverse action ratcheting tool.

PLASTIC GRIP HANDLE
A shockproof, plastic handle, 5⅛" long that is ideal for electric work. Makes your Ferret Set more useful.

DOUBLE HEX FLEXOCKETS
Saves a lot of tough work fumbling for hard to get at studs and bolts. Eight sizes: 5/16" to 3/4".

FERRET FLEXTENSION
A flexible steel cable extension connects handle and socket to work around corners and over obstructions.

EXTRA LONG FERRET SPEEDER
36½" long, 27" shank. Radius of sweep is 3½". "Palm-Grip" handle rotates to provide easy operation.

SNAP-ON TOOLS CORPORATION • 8068-J 28th Ave., Kenosha, Wis.

Enclosed find ☐ check ☐ Money order or
☐ Company Purchase Order for the $27.65 Snap-on Ferret Set
☐ Please send illustrated brochure describing 109 individual Ferret units.

Name.....

Address.....

City.....State.....

DEMING
SELF-PRIMING
Centrifugal Pumps

Fig. 3312 has separate liquid end construction so only liquid end parts need be made of special alloys for pumping corrosive liquids.

QUICK, POSITIVE PRIMING

Quick, reliable priming of these new pumps is assured by large water chambers in the casing and the semi-enclosed, non-clogging type of impellers. Repriming is automatic and not influenced by conditions of check and foot valves because the non-siphoning feature of these pumps makes them independent of such valves.

Deming Self-Priming Centrifugal Pumps are equipped with conventional stuffing boxes and split glands and can be furnished with liquid ends of all iron or all bronze with stainless steel shafts. Heavy double ball bearing construction is used on all of these flexible coupled pumps.

Capacities range up to 250 gallons per minute with heads up to 100 feet.

Among the numerous uses of these new Deming Self-Priming Centrifugal Pumps are as transfer pumps in place of rotary pumps and in sump pump work where there is insufficient space for standard Deming vertical sump pumps.

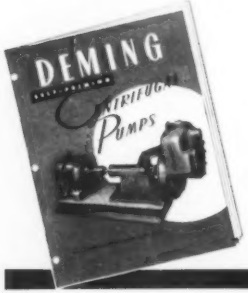


Fig. 3304 Portable Unit equipped with 1½ H. P. four cycle, air cooled gasoline engine. Capacity 5400 gallons per hour.

WRITE FOR BULLETIN No. 3300-A

This new bulletin includes performance tables on the entire line of Deming Self-Priming Centrifugal Pumps.

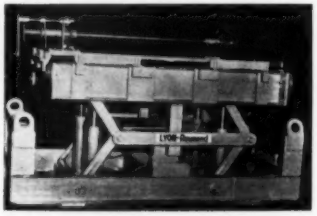
THE DEMING COMPANY
532 BROADWAY • SALEM, OHIO

it is said. Apparatus is 17½ in. high, weighs 61 lb and requires table space of 16 by 10 in. Operates on 115-v 60 cycle current. Price, complete with electric motor and belt, is $160.00. Noble metals, such as gold, are not removed by the oxifier; for this purpose distillation is essential. Bethlehem Apparatus Co.

21—DIE HANDLING TRUCK

Heavy-duty hydraulic type, has 20,000-lb capacity

This die-handling truck has four hydraulic lifting cylinders, motor driven hydraulic pump, provision for inserting and removing die slings, hand winch, retractable wheels and roller top. Its range of elevation from 28 to 44 in. allows use with presses of various heights. Four synchronized hydraulic hoists raise and lower platform by push button controls operating solenoid valves in power driven pump.



Dies are transported to and from die storage by overhead crane. A winch arrangement draws dies from presses to table and by means of sheaves also transfers dies from table to press. Winch has a 96 to 1 ratio enabling it to handle heavy dies. Retractable wheels allow empty table to be moved, but when loaded the table rests on base supports. Four sling rings allow table to be handled by overhead crane service. Roller top has three removable retaining bars. Lyon-Raymond Corp.

22—PINCH VALVES

Are designed for full pipe capacity and bubble tightness

Flex-Valves consist of the slip on, Type 7100, in sizes ½ to 2½ in., which mounts over ends of the pipe; the flanged end, Type 7200, in sizes 1 to 12 in., and the diaphragm motor type in sizes 1 to 10 in. —both operating air-to-open and operating air-to-close. These valves are said to be particularly applicable in the paper, pulp, coal, sand, chemical, sewage, sanitation, foods, mining and clay industries. They are described as practically indestructible on abrasives or corrosives not affecting rubber, Neoprene, Buna N and Butyl.

Flex-Valves are said to offer freedom from water hammer, long life on abrasives and non-clogging service. The diaphragm type is used for remote control or instrument control. Because of the low cost of these valves, large industries find them economical for use on air lines, according to manufacturer. Flexible Valve Corp.

23—AIR PRESSURE GAGE

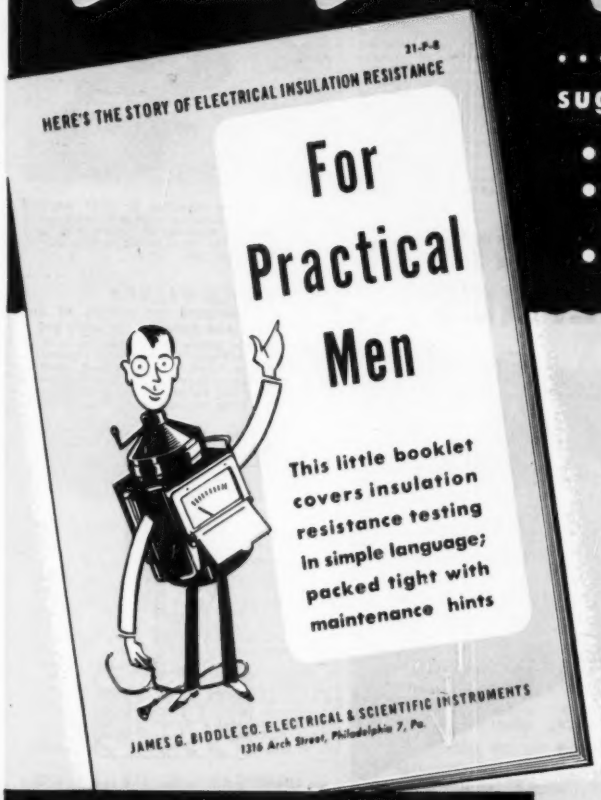
For permanent or temporary installation in any position

The Magnehelic Gage is said to be extremely sensitive. According to the manufacturer, it is efficient in checking furnace draft, testing filter resistance in ventilators and air conditioning equipment, measuring static pressure and air deliveries of fans and blowers, air velocity measurement from 400 fpm to 10,000 fpm, and checking operating efficiencies of dust collectors and processing systems.

The gage uses a flexible diaphragm supported by a cantilever spring carrying a magnet actuating pointer assembly. Vertical motion of the diaphragm is transformed to rotary pointer motion by a helical magnetic linkage. The action is described as frictionless, as the force of the magnet causes the helical assembly to assume a position in which magnetic force can travel through a minimum air gap. Motions of the magnet as small as ¼ thousandth of an inch are reflected in minute movements of the pointer, it is said.

Plus, minus and differential readings are available. The range is 0-½ in. to 0-12 in. of water. Manufacturer states that the gage is not delicate, and can be installed

This Free Booklet


21-P-8
HERE'S THE STORY OF ELECTRICAL INSULATION RESISTANCE
For Practical Men
This little booklet covers insulation resistance testing in simple language; packed tight with maintenance hints
JAMES G. BIDDLE CO. ELECTRICAL & SCIENTIFIC INSTRUMENTS
1316 Arch Street, Philadelphia 7, Pa.

. . . offers practical suggestions on how to . . .

- **prevent electrical failures**
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Five minutes' reading time will give you a practical slant on the simplicity and yet highly efficient and profitable aspects of periodic testing of the insulation in your electrical equipment.

You'll find such typical down-to-earth questions as:

What is insulation?
What makes it go bad?
How to test it?
Is it worth it?

. . . and many others—answered simply and understandably. Simply fill in, clip and mail the coupon *NOW*, for your *free* copy of this valuable maintenance aid.

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on flow meters, control equipment, automatic valves, gas-air ratios. All types of connections are possible—rubber tubing, ⅛ in. pipe thread or ¼ in. copper tubing. F. W. Dwyer Mfg. Co.

24—PISTON RING PACKING

Is developed for inside-packed reciprocating pump service

Palmetto Pisto-Rings are molded to size and are easily installed without special tools, according to manufacturer, who adds that they are flexible and won't crack and are impervious to boiler feed water, salt water, fuel oil, lubricating oil, gasoline, brine, alcohol, most acids and alkalis.

These packings do not shrink or swell in service, it is said, are heat resistant up to 450 F, and are self lubricating. Recommended as applicable for all inside-packed piston packing, Pisto-Rings come in 16 sizes from 5¼ in. OD and 3¾ in. ID to 14 in. OD and 12½ in. ID. Widths range from 1/4 in. to ¾ in. Special sizes are obtainable. Greene, Tweed & Co.

25—POLISHER-SCRUBBER

May also be used to sand, steel wool, grind and wax floors

The Super 16 is a heavy-duty machine made to handle any type of floor maintenance job. A variety of quick-change accessories may be attached for specific floor work and, with the use of a solution tank and shampoo brush it can be used to shampoo rugs.

Machine is powered with a compact induction type ¾ hp motor enclosed in a heavy aluminum casting and chrome plated. Uniform distribution of weight over brush area is provided for smooth operation and a finger spring is used to keep machine riding level regardless of floor condition. The speed of the Super 16 enables operator to polish 4500 sq ft per hr.

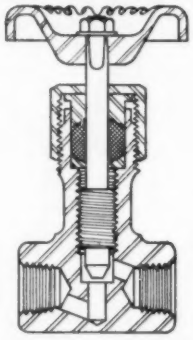
Attachments include steel wire brushes for scouring concrete, a grinding disc for re-surfacing terrazzo, cement and other mineral compositions, and a pad holder for steel wool which allows machine to

be used for dry cleaning or steel wooling surfaces. The sanding disc may also serve as a buffer by slipping a lambs wool pad over the rubber cushioned disc. S. C. Johnson & Son, Inc.

26—NEEDLE VALVES

Are designed for control of air, fluids and gases up to 3000 psi

Featuring one piece, forged bodies, said to eliminate leakage, these high pressure needle valves have tapered point needles to provide closer flow control and leakproof seating, and the valve stem is hard chrome plated for long service life. Three types

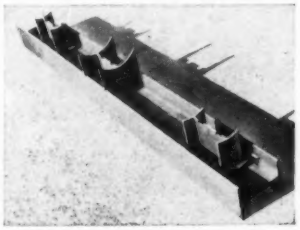


are offered: globe, angle, and tee, in ⅛ and ¼ in. pipe sizes. Each type is manufactured in brass, steel, and stainless steel. Steel bodies are cadmium plated and the brass and stainless steel bodies are finished natural. All valves in the line have large, easy-grip adjusting wheels. C. A. Norgren Co.

27—GUIDE-ANCHOR-GUIDE

For alignment of working parts at and around expansion joint

This is described as a simplified, standardized method for guiding and anchoring the expansion joint on long rigid members. The use of this rigid member is said to insure complete alignment and eliminate figuring of anchor thrusts. The Guide-Anchor-Guide takes up increased length of pipe, occasioned by temperature changes in the gases or liquids conveyed by the piping system, and is designed for easy



THE TOPS IN SANITARY WASHING FACILITIES...

Preferred by America's Industrial Leaders

Partial View of Wall Type Bradley Washfountain Installation in Houston Packing Co. plant, Houston, Texas.

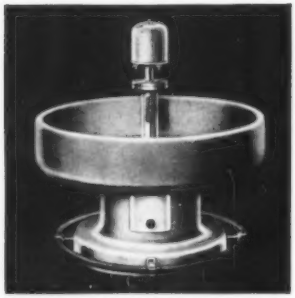
In modern, progressive plants where cleanliness and health-safety are of vital importance, Bradley Washfountains have become the standard wash fixture.

The semi-circular types as shown above and the full-circle Bradleys both offer the same sanitary features—clean running water, automatic foot-control, no faucets to touch or maintain,—five to 10 persons can wash simultaneously. Fewer connections are required, and less pipe and space.

For new plants or modernizing your present washrooms, install Bradley Washfountains.

BRADLEY WASHFOUNTAIN CO., 2371 W. Michigan Street, Milwaukee 1, Wisconsin.

Distributed Through Plumbing Wholesalers.



Full-circle 54-inch Bradley Washfountains serve up to 10 persons simultaneously.

Write for Catalog 4701 today.

BRADLEY Washfountains

fastening to building. Anchor and guide connections are pre-fabricated to fit and are welded to the pipe in the plant. Can be modified to accommodate angular changes in run of pipe. Piping Specialties, Inc.

28—BONNET GATE VALVE

Is made of stainless steel for corrosion resistant service

This corrosion-resistant, economical valve was developed to meet demands for a small size stainless valve, simple in design and reliable in performance. Construction features include union bonnet design, said to afford long service life and simplified maintenance, ball and socket point contact discs and a minimum of six turns of packing to assure effective sealing. Available in various stainless alloys in sizes ½, ¾, and 1 in., this valve is described as well suited for fixed plant installations and for use on fabricated equipment. The Cooper Alloy Foundry Co.

29—SLIP-JOINT PLIERS

Are lightweight, have bright finish and come in several sizes

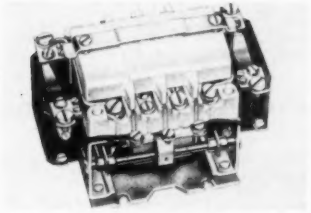
These new combination slip-joint pliers are available in 5, 6, 8 and 10 in. sizes; a 7 in. size is also made with side cutter. They are made of special high carbon steel, heat-treated after forging so as to avoid decarburization of the jaw and joint areas and assure long life for the broached teeth in the jaw gripping surfaces.

Nail cutters are of unusual design in that one side of the cutter employs fine serrations to grip and hold the nail or wire from slipping during cutting operations. Individually cartoned, pliers are finished in bright nickel plate with jaw and handle areas buffed bright. J. H. Williams & Co.

30—MAGNETIC STARTERS

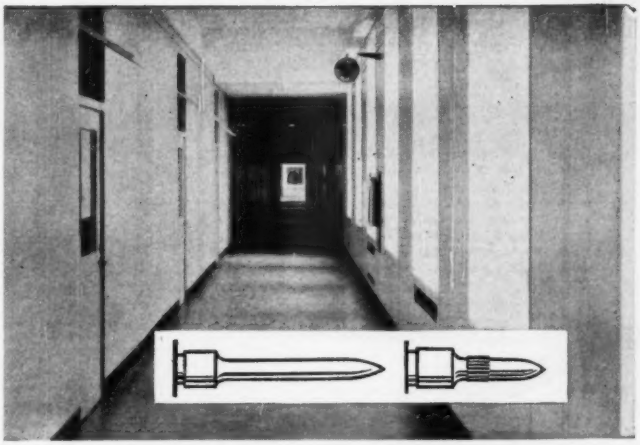
Have bases and protective hoods of new resin compound

Plaskon Alkyd, the new polyester type resin compound used in molding the bases and hoods of these starters is described as a thermosetting molding compound with desirable electrical properties. It is said to exceed arc resistance of many other materials by as much as 50 to 65 per cent. It is also claimed that it does not support combustion, had a hard abrasion-resistant surface, has high solvent and chemical resistance, and provides superior dimensional stability.



Because of its resistance to organic solvents, fats, oils, acids and water, company engineers believe its use will permit these starters to be installed in locations formerly considered detrimental to operation of such equipment. The Arrow-Hart & Hegeman Electric Co.

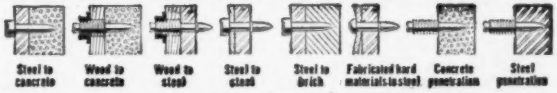
(Continued on page 66)



35,000 *Ramset* fasteners cut costs in this building

Substantial cost savings and more rapid completion of the work resulted from the use of RAMSET FASTENING SYSTEM in this large building at Silver Springs, Maryland. Metal channels were fastened to concrete ceilings and floors with the light, portable RAMSET TOOL, using 35,000 RAMSET FASTENERS as illustrated. Each fastening took less than a minute working time—much faster and far less costly than old-fashioned drilling and chipping.

RAMSET SAVES TIME AND MONEY ON MOST FASTENING JOBS



Requiring no air, electric or other external power, because it is self-powered, the RAMSET TOOL is simple and easy to operate and can be used in small, confined spaces. In an hour, we teach any good workman to be a competent *"Ramsetter"*, able to do a wide variety of fastening jobs quickly and competently.

COMPARE "RAMSETTING" WITH YOUR PRESENT COSTS

Let us give you a 15-minute demonstration of the RAMSET SYSTEM —and prove with facts and figures how it will save you 50% or more in your fastening work. Just mail the coupon. *Stemco Corporation, Cleveland 16, Ohio.*

MAIL THIS COUPON

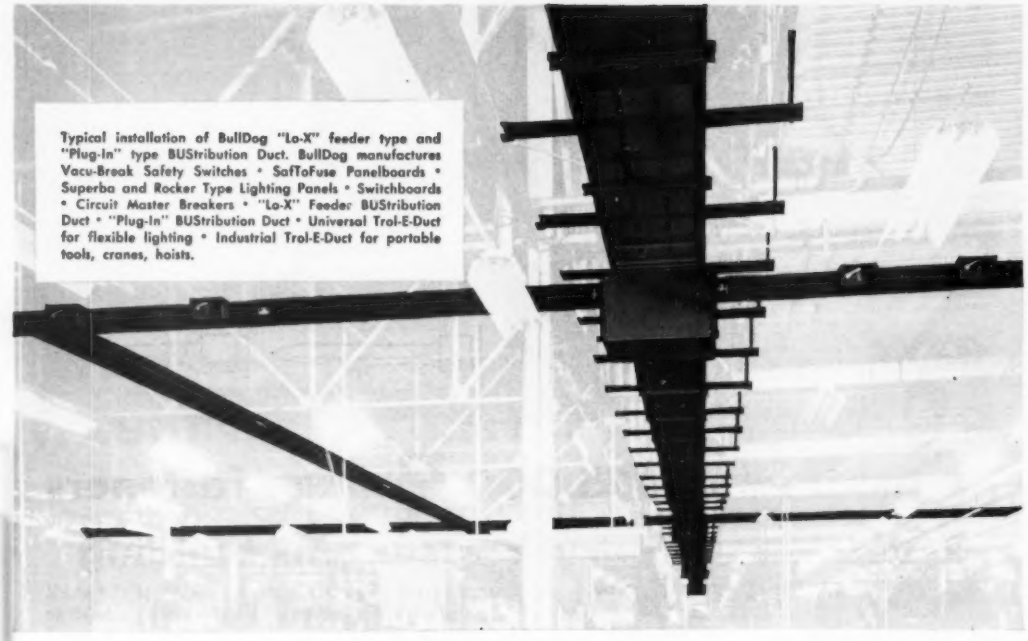
Stemco Corporation,
Cleveland 16, Ohio

Please demonstrate with facts and figures how I can make a profit with RAMSET FASTENING SYSTEM.

Name _____

Address _____

City _____



Typical installation of BullDog "Lo-X" feeder type and "Plug-In" type BUStribution Duct. BullDog manufactures Vacu-Break Safety Switches • SafToFuse Panelboards • Superba and Rocker Type Lighting Panels • Switchboards • Circuit Master Breakers • "Lo-X" Feeder BUStribution Duct • "Plug-In" BUStribution Duct • Universal Trol-E-Duct for flexible lighting • Industrial Trol-E-Duct for portable tools, cranes, hoists.

Power with a foolproof future

CAN you foresee the many changes which may come to your plant in the next five or ten years?

Naturally not! But when it comes to electrical power distribution, BullDog BUStribution systems offer flexibility to meet any change the future holds.

Take machine layout changes: With BullDog "Plug-In" BUStribution Duct, moving machinery is like moving household appliances—simply unplug machine from duct, move, and plug in at new location.

If necessary, your entire BUStribution system can be easily and quickly dismantled, moved, and set up . . . without scrapping a nut or bolt—it's flexible and salvable.

BullDog "Lo-X" BUStribution Duct, for secondary feeders, is prefabricated to exact performance standards. Ventilated construction and paired-phase arrangement of silvered-copper bus bars reduces temperature rise, assures high current-carrying capacity and reduces reactive voltage drop. BUStribution Duct is sturdily built for years of finest service.

Your local BullDog Field Engineer will be glad to show you a BullDog BUStribution system in your own neighborhood. Let him look over your requirements and answer your questions.

BullDog Field Engineers welcome the opportunity to sit in with you during the early planning stages of a building project. Their knowledge of electrical distribution layout can mean savings in installation costs, as well as efficiency and reliability in actual operation. Why not take advantage of this service?

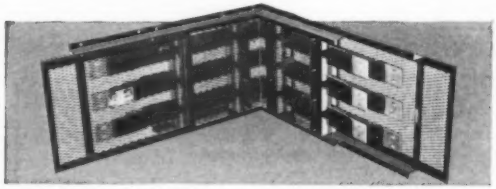
BULLDOG ELECTRIC PRODUCTS COMPANY

DETROIT 32, MICHIGAN • FIELD OFFICES IN ALL PRINCIPAL CITIES

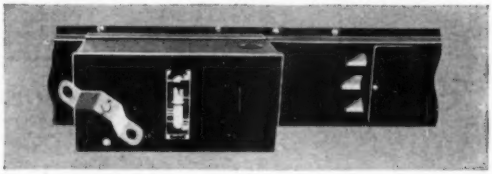
IN CANADA: BULLDOG ELECTRIC PRODUCTS OF CANADA, LTD., TORONTO

BULLDOG

HEADQUARTERS FOR ELECTRICAL DISTRIBUTION



Section of "Lo-X" BUStribution Feeder Duct, used for main secondary power feed. "Lo-X" Duct is prefabricated in ten-foot lengths, in capacities from 600 Amps. to 4000 Amps., 600 Volts or less. Close spacing and paired-phase arrangement of bus bars reduces reactive voltage drop



Section of "Plug-In" Duct, showing Vacu-Break Bus Plug for tap-off purposes. Crescent-shaped openings make it impossible to insert plugs incorrectly. Each ten-foot section of "Plug-In" Duct has ten such openings. Capacities: 200 Amps. to 1350 Amps., 600 Volts or less.

Bulletins on Current Plant Problems

(Continued from page 22)

struments for plant use, cross indexed and planned for easy ordering. Instruments illustrated and described include etched stem glass thermometers in ranges from -120 F or C up to 1100 F or 620 C; armored thermometers, ASTM and other special use thermometers; industrial thermometers for permanent installation or intermittent batch use; psychrometers; thermo-regulators; mercury-plunger relays; hydrometers; specific gravity scales and special use scales. Price list included. H-B Instrument Co.

141 Technical Equipment—Bulletin 315, 8 pp is an ordering catalog listing technical devices—portable temperature recorders, corrosion resistant immersion heaters, manometers, chronographs. Equipment is illustrated by photos and sketches. Includes sizes, other ordering data, prices. Andrew Technical Service.

142 Water Analysis Equipment—This 22-pp booklet illustrates and describes manufacturer's line of apparatus and test sets specially designed for industrial water testing. Explains applications of equipment listed, giving brief instructions for use, available sizes. W. H. & L. D. Beis.

METALS, METAL PARTS

143 Corrosion Resistance of Castings—This is a 2pp comprehensive data sheet showing the corrosion resistance of stainless steel, Monel and nickel castings. It is designed to aid plant engineers in selecting the best alloy when corrosive agents are known. Covers more than 100 corrosive materials—acids, alkalis, salts, organic materials, and those used in paper mills, pickling operations, food processing. The Cooper Alloy Foundry Co.

144 Sheet and Plate Alloy—Eight-pp Bulletin 502 features the advantages and applications of a corrosion resistant sheet and plate alloy, Durimet 20, recommended for laboratory fume ducts, hoods, table tops, troughs, and battery room ducts. Tells chemical composition, mechanical and physical properties of the alloy, discusses the corrosion protection afforded by it and lists common corrosives to which it is resistant. Pictures several installations, lists many others. Also covers fabrication of ducts and gives available gages, sizes, weights and finishes. The Duriron Co., Inc.

145 Self-Lubricating Bearing Materials—Four-pp Catalog 102 on materials for experimental emergency and small lot bearing requirements contains listings of solid and cored bars in all sizes up to 12 in. long and 2½ in. dia. and 6 by 18 in. plates ⅛ to 1 in. thick. Also includes specifications and sizes of finished, self-lubricating powdered metal bearings. The Wel-Met Co.

146 Shims and Stampings—This booklet is an 8-pp data file containing many photos and covering lock nuts, stampings and laminated shims. Includes specifications, design factors and application information. Describes in detail and illustrates by photo the special advantages of precision laminated shims, and gives properties and specifications of the shim stock used. Laminated Shim Co., Inc.

PUMPS

147 Centrifugal Pumps — Construction features of a single stage, double suction pump developed for high efficiency and low maintenance are described in 24-pp Bulletin 06B6146A. Carries tables of sizes, approximate dimensions and head capacities, tells how to figure pumping head, and tabulates friction loss for water per 100 ft of pipe. Installations utilizing these pumps, according to bulletin, include filtration and sewage plants, pumping stations, quarries, paper mills, steam power and chemical plants, and on board ship. Allis-Chalmers Mfg. Co.

148 Vacuum Pump Data—Catalog 700, 36 pp, describes and illustrates manufacturer's line of vacuum pumps, including specifications, and their applications in industry. Also contains excellent vacuum data and engineering information, together with actual vacuum processing problems for many industries. Charts, graphs and tables are provided for reference. Other equipment for vacuum processing is briefly described and specifications given. F. J. Stokes Machine Co.

149 Centrifugal Pumps—Bulletin 30, 16 pp, describes and illustrates manufacturer's horizontal centrifugal pumps of both self-priming and non-priming types. Explains general operating characteristics of the pumps, discussing construction features which contribute to better performance and longer service. Industrial applications are discussed and illustrated by photos of installations. Includes table showing friction of water in pipes. The LaBour Co., Inc.

FANS

150 Fans for Ventilating and Cooling Towers—Four-pp Bulletin TMC-37 contains many photographs of installations of manufacturer's fans in cooling towers and as ventilating units for foundries, pumping stations. Brief text emphasizes construction features which offer corrosion resistance, reduced maintenance. The Moore Co.

151 Cold Facts on Fans—Eight-pp Bulletin 241 discusses air circulators for coolers and refrigerated areas, telling advantages of manufacturer's high velocity refrigerator fans in removing ice and water and in dissipating odors, and in germicidal lamp installations. It describes and illustrates several models, giving capacities and specifications. Sketches illustrate suggested fan installations. Reynolds Electric Co.

FUEL OIL, LUBRICANTS

152 The Answers on Turbine Oil—This 12-pp booklet answers several questions plant engineers ask about turbine oils, including: What causes deposits or sludge? What causes acidity increase? What causes corrosion in turbines? Explanations are brief but thorough. Booklet is illustrated with turbine installations in which manufacturer's products have been used successfully. Standard Oil Co. (Indiana).

153 Motor Bearing Lubricant — Silicone Notes No. D-6, 4 pp, contains information on the use of a silicone grease in the bearings of electric motors. It includes instructions for lubricating open and shingle shielded ball bearings and relubrication schedules based on the manufacturer's experience in developing and testing the product. The use of double shielded and cartridge type ball bearings prelubricated for life with the grease is also discussed. Dow Corning Corp.

154 Oil Conditioner—Eight good reasons for using manufacturer's oil conditioner are presented in this 4-pp bulletin. It also explains how this product works to condition fuel oil and effect a chemical removal of sludge, touching upon some of the problems caused by "that imp, Sludgey." Alkan-Murray Corp.

HEAT TREATING, DRYING

155 Gradiation Heating—Titled, "Speed Heating of Metals by the Gradiation Process," this interesting 30-pp book presents "work now being done" utilizing an improved technique of heat processing based on the exposure of metals to high gradient heat sources. It explains the method, discusses its metallurgical benefits, and covers its use in forging, localized hardening, brazing welding, indirect heating, patterned heat and other applications. A special section is devoted to a discussion of how the process patterns heat to the geometry of metals. Book is illustrated throughout with photographs and schematic drawings in color. Available to qualified plant engineers. Selas Corp. of America.

156 Flame Hardener—An electronic machine offering positive control for four methods of flame hardening is featured in this 30-pp catalog. The electronic control is described in detail and illustrated by photo, as are standard attachments. Photos also illustrate standard shop procedure and the four basic methods of flame hardening; and a four-color diagrammatic sketch illustrates the "ABC of flame hardening." One section of the book is devoted to the metallurgy of flame hardening. Also included are typical maximum and minimum sizes of work handled, dimensions and physical specifications. The Stearns-Roger Mfg. Co

157 Rotary Drying Equipment—Bulletin 16-D is a 32-pp catalog on company's complete line of rotary dryers, kilns, and coolers. It discusses direct, semi-direct and indirect heat dryers, double-shell and single-shell dryers, parallel-flow and counter-flow dryers, steam tube and hot air dryers. Covers air type, water spray, and partially submerged type rotary coolers, also counter-flow rotary kilns for calcining, roasting or oxidising. Includes overall dimensions of all models as well as "flow sheets" showing how these units are used in continuous flow operations in chemical, ceramic, stone products, coal metallurgical, sewage treatment and other processes. Hardinge Co., Inc.

TOOLS, MACHINING

158 Cutting and Threading Tools—Catalog 49 is a 36-pp manual crammed with useful information on a complete line of hand and electric power tools for cutting and threading pipe, bolts and conduit. Photos and other illustrative material show the tools as they actually look and cross-sectional drawings indicate, step-by-step, the way they function. Specifications are easy to read and every tool is coded to simplify ordering. In addition to describing each tool, text covers its applications, important design features and maintenance. Beaver Pipe Tools, Inc.

159 Machine Tools—Catalog 17, 24 pp, is liberally illustrated with many special tools including expanding mandrels, special spring chucks, milling machine adapters, special collets, sleeves and chuck jaws, as well as manufacturer's line of

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Bulletins on Current Plant Problems

screw machine collets. Advantages of diamond-serrated quick-change, full-floating and standard master collets and various types of master feeders are given. Half of the catalog is devoted to specifications and list prices of collets and fingers for many makes of automatic and hand machines and turret lathes. Sutton Tool Co.

160 Making Chuck Jaws—Bulletin BS-11-48 tells how to make chuck jaws, illustrating the instructions with step-by-step photos and explaining the merits of a low-temperature-melting bismuth alloy for the work. Also covers the chucking of small parts for fast production, nests for drill jigs, and magnetic chucks. Cerro de Pasco Copper Corp.

161 Tube Expanders—Bulletin 420, 6 pp, gives data on tube expanders for condensers, heat exchangers and general small tube rolling. Explains how these expanders incorporate a new, adjustable ball bearing thrust collar and are designed for efficient, easy rolling and maximum roll length adjustment for various tube sheet thicknesses. Four models are shown. Also illustrated is a complete line of tools and wrenches for heat exchanger tube assembly as well as various models of tube cleaners. Thomas C. Wilson, Inc.

SAFETY, INDUSTRIAL HEALTH

162 Face Shields—Protective face shields for those handling acids and other chemicals, pouring hot metal, or working wherever face and eyes are endangered by light or flying particles, are featured in 4-pp Bulletin CH-3. Describes advantages of the standard and de luxe types, illustrates head gear styles and lists sizes and colors. Mine Safety Appliances Co.

163 Sight Conservation Program—"Improved Industrial Vision" is a 24-pp brochure developed in cooperation with industry and the opthalmic professions. It features case histories and charts demonstrating the cost saving values of an industrial safety and visual efficiency program. Large and small plants are represented in this report. Tells, briefly, what the program is, lists company services offered, and describes some of the benefits to be derived. American Optical Co.

MISCELLANEOUS

164 Design for Radiant Heating—Catalog 134 is an excellent 60-pp manual offering a simplified method for designing radiant panel heating systems. Following a brief discussion of the principles of radiant heating it takes up seven necessary steps in radiant heating design; calculation of building heat loss, design of heating panels, layout of distribution piping, amount of water needed, selection of booster pump, sizing the distribution piping, and selection of boiler. It then presents three complete design examples, showing in detail how each of the seven steps is applied. Book is illustrated with photos and sketches of equipment and engineering drawings, and contains a great deal of practical data. It's free to qualified plant engineers. Bell & Gossett Co.

165 Industrial Perforating—Catalog 6, 36 pp, is an ordering guide containing actual-size illustrations of available patterns and such data as hole diameters, number of holes per square inch. Includes table showing proper gage to use for different metals, also detailed engineering information on how to specify perforating for metals, paper, cardboard, masonite and plastics. Accurate Perforating Co.

166 Flotation Equipment—Bulletin F10-B29, 22 pp, describes and illustrates the industrial use of flotation in the recovery of oils, metal filings and coal fines, the reclamation of salt, removal of copper from gasoline, de-inking of paper pulps and processing of wastes. Contains a general discussion of flotation and its flexibility. Discusses design features of manufacturer's flotation machine and its applications, giving data on capacities and sizes, illustrating special advantages. Denver Equipment Co.

167 Packless Expansion Joints—Folder 149, 4 pp, describes and illustrates non-equalising expansion joints of the single and multiple corrugation types and self-equalizing expansion joints in 3 to 5 in. sizes and in 6 to 24 in. sizes. Discusses the advantages of these packless corrugated joints, lists sizes and metals available and tells applications for the various types. American District Steam Co.

168 Paint Selector—With this 3-pp paint selection check chart a plant engineer can select quickly the paint or paint product with exactly these performance characteristics demanded by a specific job. Points covered include type of surface to be painted, resistance to corrosion, weathering, drying time, color fastness, colors available, average coverage and even cost per sq ft. A valuable tool, the back of the chart contains further information on paint selection, including "reason why" explanations. The Wilbur & Williams Co.

169 Felt for Mounting—Valuable engineering data on felt for machine mounting is contained in this 20-pp booklet. Illustrated with application photos and graphs showing frequencies and harmonic motion, the text covers an explanation of vibration, installational data and recommended loads and natural frequencies of several grades of the felt. It describes and illustrates examples of this mounting as applied to a Diesel engine, printing press and hosiery machines. Lists many types of equipment for which felt is recommended isolation. Western Felt Works.

170 Adhesive and Their Uses—The story of adhesives and manufacturer's facilities are presented in this 6-pp illustrated booklet to acquaint engineers with the large variety of adhesive raw materials and chemicals now being employed to meet industrial production requirements. Two main divisions of basic adhesives are described and a product list shows and uses and industries served. Illustrations show the manufacturer and laboratory control methods used in the production of these adhesives and other pictures show them in use. Paisley Products, Inc.

171 Tube Fittings Chart—Bulletin 219 is a letter-size display card conveniently listing nomenclature for 14 tube fittings and five fitting parts. Shapes are illustrated and described with code designations for each in four types, in steel, stainless, brass and dural. Corresponding AN part numbers are also listed, and a chart relating tube size numbers with tube OD's and pipe thread sizes is included. The Parker Appliance Co.

172 Tank Saver—How a plant engineer can save his tanks from the junkyard is explained in this 6-pp folder. Method presented consists of cleaning the tanks and lining them with elastic porcelain, a ceramic material, chemically inert, with good adhesion to iron and steel and expanding and contracting at the same rate. Kirwan Engineering Co., Inc.

173 Industrial Insulations—This 12-pp booklet on Fiberglas insulations contains informative engineering data and many photos covering the industrial uses of this material. Gives complete ordering information, prices, coverage. Covers boards and panels, mesh blankets, insulating wool, insulation for pipes, block insulation, and a rigid insulation for low temperature installations. Owens-Corning Fiberglas Corp.

174 Glass Properties—Bulletin B-53, 16 pp, contains basic information about important properties of three commercial glasses. Covers the composition of glass, its mechanical properties, thermal stresses, heat transmission, electrical properties, corrosion resistance and viscosity. Includes technical data, charts and tables. An interesting booklet—it is believed that much of its material has never before been assembled in a presentation of this type. Corning Glass Works.

175 Inhibition of Corrosion—This is a 4-pp analysis of the causes and mechanisms of corrosion of both the bimetallic and monometallic types. Explains use of inhibitors to stifle corrosion and tells merits of manufacturer's chrome inhibitors. Wright Chemicals Corp.

176 Valves and Specialties—The gate and needle valves, screw machine products, hose nipples, tubes, flanges, hot rolled bars and welding electrodes described in Bulletin W-350-B5B, 6 pp, are made of Worthite, a stainless alloy produced for company use in valves handling corrosive solutions, many of which are listed. Gives sizes, specifications for all equipment listed, includes photos. Worthington Pump and Machinery Corp.

177 Variable Speed Device—Bulletin VN-4912, 8 pp, completely describing the improved design of manufacturer's variable speed units for light horsepower requirements, includes description, photographs, rating and dimensional tables and prices. It discusses the units construction, simplicity of installation, principle of operation and applications. Reeves Pulley Co.

178 Transmission Belting—Catalog M-4922, 28 pp, gives detailed design, engineering and performance data on manufacturer's line of transmission belting. Tables on belt speeds, arc of contact, friction, horsepower correction, and service factors are included in the manual, together with hints on proper selection of a belt and procedure for analyzing belt drives. Illustrations include many photos of belt installations and drawings of transmission drives. United States Rubber Co.

179 Large D-C Motors—Latest construction features of manufacturer's large d-c motors for applications requiring wide speed variation and fine speed control are discussed in 40-pp Bulletin OB56002A. Included is a comprehensive description of "frog leg" armature windings, a combination wave and lap winding that gives good commutation without cross-connectors, and views of the new style mill-type spherical seated thrust bearing with welded-steel pedestal for heavy service. Controls for the motors, currently being used to drive metal rolling equipment, mine hoist, paper machines, rubber mill rolls, plastics calendars and traction equipment are also covered. Allis Chalmers Mfg. Co.

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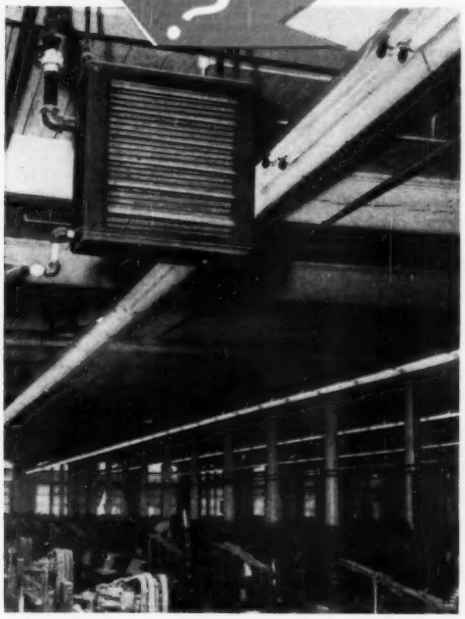
Which Thermolier Unit Heater is the right one . . . for this spot?

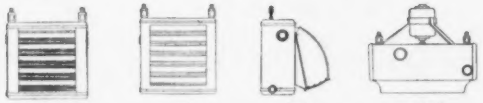
Conventional finned tube type heating element of standard Grinnell Thermolier Unit Heater delivers maximum heat with minimum maintenance *under ordinary conditions.*

Heating element of Grinnell Textile Thermolier Unit Heater consists of a series of parallel copper sheets attached to the tubes. The absence of hundreds of lint collecting fins allows unobstructed air flow with self-cleaning action *even under extreme lint and fly conditions.*



Unit heating is obviously the most economical, flexible type of heating for a textile mill. But the air in some rooms of a mill is filled with lint, fly and dust. These foreign particles collect on the fins of the heating element of conventional unit heaters, mat together and often plug the heating element solid in a few days. To correct this condition, Grinnell designed the Textile Thermolier in which these hundreds of lint and fly collecting fins are eliminated without sacrificing heating capacity.

There is a Grinnell Thermolier in a size and type for maximum heating results under any operating condition.



horizontal delivery | textile model | velocity nozzle | vertical delivery

Grinnell unit heaters, pipe fittings, pipe hangers and other piping products are carried by Grinnell jobbers in almost every city and town. Back of them stands the warehouse and engineering service of Grinnell's twenty-two branches.

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Grinnell Company, Inc., Providence 1, R. I. Branch warehouses: Atlanta • Buffalo • Charlotte • Chicago • Cleveland • Cranston • Fresno • Kansas City • Houston Long Beach • Los Angeles • Milwaukee • Minneapolis • New York • Oakland • Philadelphia • Sacramento • St. Louis • St. Paul • San Francisco • Seattle • Spokane

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"TUSKO" WALRUS POLISHING LEATHER

GET A GRIP on the new FAVORITE®

Takes Heavy-Duty Loads — with all working parts in compression

. . . and this is just one feature of the new Favorite Deluxe reversible ratchet wrench that makes it the most dependable for strength, speed and efficiency.

- It's a Double-Header. Each socket accommodates two size nuts; each handle, a variety of sockets.
- Patented Synthetic Rubber Retaining Ring* grips socket fast-tight, yet snaps on or off for quick interchange of heads.
- Ratchet action is fast, positive, straight-ahead.
- Strong, one-piece, built-in pawl permits instant reversal of action.
- Angle-set of socket and pawl teeth provides sure clutch fit.

Do yourself a favor—investigate the Favorite Deluxe today! Write for Bulletin F-12

* Manufactured by Greene, Tweed & Co., North Wales, Pa., licensee under Pat. No. 2,456,355

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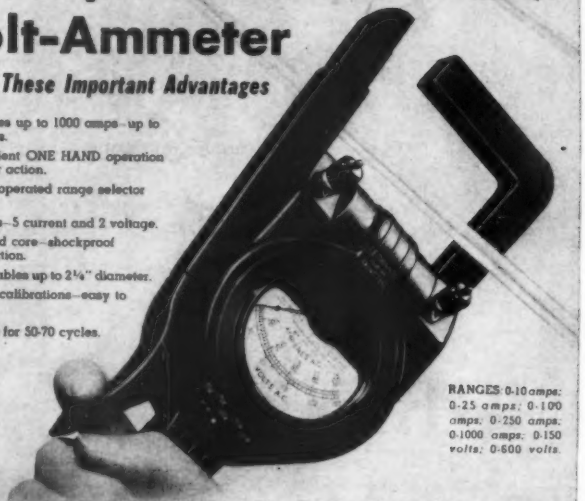

RANGES: 0-10 amps; 0-25 amps; 0-100 amps; 0-250 amps; 0-1000 amps; 0-150 volts; 0-600 volts.

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New Products and Methods

(Continued from page 61)

31—DURIMET 20

Noted for corrosion resistance, is now available in sheet and plate

The Durimet 20 analysis was developed during the war for severe corrosive applications, especially handling sulfuric acid. According to manufacturer of this alloy in its sheet and plate form, its importance lies in the fact that it can be applied to corrosive services formerly uneconomically handled by materials of insufficient strength or heat transfer, or by high priced metals or by low priced metals with short life.

While higher in price than certain other materials, it may be expected to outlast them 100 to 1, it is reported. Production has started, chiefly on gages 24 to 11 and smaller thicknesses of plate. The range is from 24 gage to ¾ in. plate. The Duriron Co., Inc.

32—FLUSHING SYSTEM

Is engineered to operate automatically on a 24-hr cycle

This automatic flushing system is intended primarily for operation of urinal flush valves in public toilet rooms and is adaptable to both new and existing installations of manufacturer's equipment. Operated on a 24-hr cycle, the system can be set for flushing at close intervals during the day —every 5 min, for example—and at hourly intervals during the night. Timing is automatic, once the time intervals have been selected on the clock dial.

The economy of the system is pointed out in terms of water saved by fewer flushes during the hours equipment is little used. Other advantages include better sanitation, simplicity of equipment and wiring and low consumption of electric current.

Timer, which controls interval between flushes, and the flush valve motor operator, which replaces handle assembly, are both arranged for 110 v, 60 cycle, a-c supply. A 24-hr clock dial is provided with timer and this may be located wherever convenient. Sloan Valve Co.

33—WATERPROOF FINISH

For painting and weatherproofing asphalt shingles

Developed especially for restoring and beautifying dirty, weatherbeaten insulated brick siding. Asphalt-Seal is said to stop bleeding and crumbling of asphalt side walls and roof shingles by sealing the pores of the surface—leaving a colorful waterproof finish which will withstand atmospheric and weather conditions. Available in 1 and 5 gal containers, this finish is ready mixed for immediate applications and comes in three light and four dark colors. Dewatex Mfg. Corp.

34—PRE-COATING

For blueprint paper is intended to produce sharper prints

Mertone is a new pre-coating for blueprint paper, developed to produce prints with uniform deep blue backgrounds without burning out the faint lines of tracings. Other advantages claimed for Mertone include greater latitude in printing speeds, fewer changes in machine speed and less waste through over-exposure. Monsanto Chemical Co.

35—UNIT BAR SCREEN

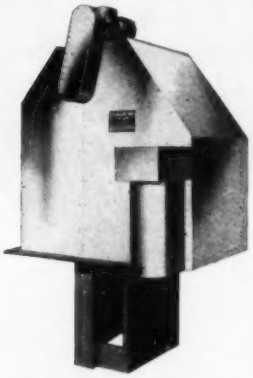
Is fully automatic and is mechanically cleaned

This bar screen, with optional grinder for sewage plants, is adaptable for minimum channel widths and settings, or for parallel multiple installations for large flows. Steel frame is designed for easy insertion into slots formed in concrete channel walls, with only four bolts to mount the screen on the operating floor. Made for channels 2 ft 6 in. to 5 ft wide, with minimum depth setting at 2 ft 6 in.

A special feature is the pivoted rake provided to cause the teeth to enter bottom of the screen bars horizontally. The rake gets under and picks up screenings from the bottom, according to manufacturer, and does not push them up in

front of the bars out of reach of the rake.

Total height is 5 ft. Above-floor structure is enclosed with stainless steel panels with spring-lock fasteners. Each unit is furnished with automatic electric control.



Shear pin protection is provided for overloads. Optional screenings grinder mounts below opening of sorting tray. It is operated independently and is easily removed and disassembled. American Welf Works.

36—AIR GUNS

Are "streamlined" to produce a faster operating air tool

Principal innovation in design here is styling of the gun handle to fit more easily and quickly into the hand. Another feature is the suspension hook, so designed that it may be quickly hung up and retrieved by a sense of touch alone.

These air guns are said to have a positive air shut off which retains its effec-

tiveness for long periods under heavy use. Nozzles are interchangeable. Most widely used type delivers a concentrated conical blast. Other nozzles include one that delivers a 45 deg up-blast, flat-air spray, a fan blast, and an adjustable air stream nozzle. Three- and 6-in. extensions are available.

Featured gun is the Type DA pistol grip style with trigger valve in normal trigger position. Type DB, smaller and lighter, has trigger above the handle and operated by thumb pressure. The Type DC is for use where constant flow of air is desirable without holding down trigger button. Its needle valve adjusts for any volume of air from 0 cfm to maximum capacity of nozzle. Paasche Airbrush Co.

37—COAL CRACKER

Is packaged lump reduction unit for large users of coal

This unit is designed to turn out 30 to 50 t of small egg or nut coal per hour, depending on firmness of coal, handling up to 10 in. lumps. The toothed dual rolls are so tensioned and the teeth so shaped and meshed that a minimum of fines result, according to manufacturer.

Cracker has V-belt drive and is furnished with either 10 or 15 hp, 220-440-v, a-c motor, depending on characteristics of coal

to be cracked. Gears to provide either $^3/_8$ to $1^3/_8$ in. or $1^3/_8$ to $2^3/_4$ in. reduction are available. Simple roll spacing adjustment is provided to permit setting to sizing desired within these limits, and adjustable tension springs to prevent damage to rolls from stones and tramp iron. Rolls have heavy-duty self-aligning bearings. Eagle Iron Works.

38—PARTS WASHER

For automatic removal of dust and other foreign substances

This machine is a simple, automatic, motor-driven unit operating a loading tray into and out of a soaking solution for the active soaking and active washing of dirty metal and other parts. Recommended for machine shop and tool room, it is designed to remove oil, chips, grease, carbon smut, and sludge from all surfaces, reaching inside corners, threaded holes and grooves.

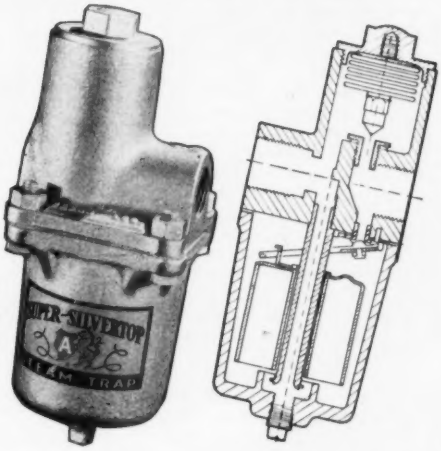
Operator places dirty parts on tray above solution level, closes cover, releases power and lets washer run until parts are thoroughly cleaned. He stops machine with tray above solution level to remove parts without getting his hands wet.

The slow dunking combines benefits of both a soaking action and a swishing and washing action. There is said to be no

USE THIS TRAP FOR—

1. **FAST "HEATING-UP" OF STEAM-USING UNITS**
2. **HANDLING LARGE AMOUNTS OF AIR ESPECIALLY AT VERY LOW PRESSURES**
3. **ON EQUIPMENT WHERE STEAM IS TURNED ON AND OFF FREQUENTLY**

SUPER-SILVERTOP
COMBINATION OPEN FLOAT AND THERMOSTATIC TRAP



THE ANDERSON SUPER-SILVERTOP combination Open Float and Thermostatic Steam Trap is widely used for the purposes mentioned above . . . for unit heaters, pipe coils, blast coils, autoclaves, etc.

Note on the diagram (right) that this trap has a standard valve and seat actuated by an inverted bucket for handling condensate. In addition, at the top is an auxiliary valve and seat actuated by bellows for air handling. This by-passes the air around the water seal. When the system is free of air, this by-pass is closed, and the trap drains condensate as an inverted bucket trap. This design takes care of air elimination at extremely low pressures. Furnished in six sizes, ¾" to 1¼", for pressures of from a fraction of an ounce up to 50 pounds. Write for the free book, "Solving Steam Trap Problems."

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SUPER-SILVERTOP STEAM TRAPS

HOW TO SAVE TIME AND MONEY WHEN YOU HAVE AN ELECTRICAL PROBLEM

You can save time and money on electrical alterations, conversions and new construction through the employment of K-B's **Engineered Electrical Construction.**

By placing the complete responsibility for engineering, procurement and construction in the hands of one reliable firm, you can save the time of important personnel in your organization and realize the benefits from your investment in an improved electrical system at an earlier date. Undivided responsibility for performance of all phases of the work results in lower overall costs.

Our staff of Electrical Engineers and Construction Specialists insures an electrical system designed to best meet your needs and efficient installation in the shortest possible time. More and more of America's most progressive industrial concerns are employing our complete facilities to solve their electrical problems.

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accumulation of sludge at bottom of tank, because tray stops within 3 in. of bottom. Washer uses a cold liquid solution; can be equipped with heating units. In four sizes, of 20, 35, 75 and 85 gal capacities. The Super-Soak Co.

39—SCREW GRAB

For overhead handling of pulp and similar materials

This screw grab has three floating heads, each with three motor-driven screws or augers that screw into the pulp and hold it secure when in transit. Three bales can be handled at a time. Because of the floating heads, bales can be picked up when stacked unevenly and with rope as much as 6 in. below one another. A light on each head, visible to crane operator, shows when bales are in position.

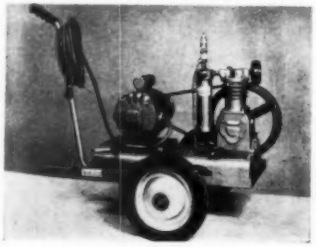
The grab is designed to operate as a part of manufacturer's overhead crane or carrier, with complete control by crane operator. It is intended for fast, efficient handling and for high piling (from 30 to 40 ft), as well as for eliminating need for aisleways. Unit illustrated handles 1500 lb; equipment can be built for other capacities. Cleveland Tramrail Div., The Cleveland Crane & Engineering Co.

40—PORTABLE COMPRESSORS

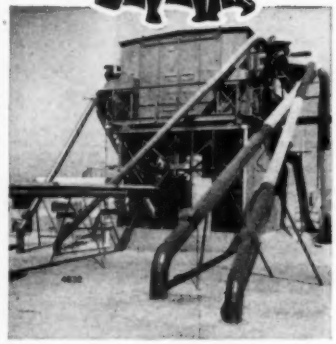
Piston type, offer two working pressures, two air deliveries

One of these air compressors, Model B-140-DS (shown) is powered with a ½ hp electric motor; Model G-140-DS is powered with a ¾ hp gasoline engine. Both operate at 150 lb pressure delivering 2.4 cfm free air for tire inflation, operating a grease gun, air blow gun or other uses requiring high pressure. By shifting a lever, the compressor is a continuous-running unit at 50 lb pressure delivering 3.2 cfm free air for paint spraying, insecticide spraying and other applications requiring low pressure and increased volume.

Both models are easily portable, with or



DUST TURNS TO $$ THE *SLY* WAY



Sly Dust Filter on roof of the Quaker Oats Plant at Akron, Ohio. Pipes shown carry dust-laden air from grinding apparatus to filter.

Dust is simply a product suspended in air.

In many industries it is being reclaimed, packaged, and sold at substantial profits; e.g., rock products, milling grains, cosmetics, soap powders, etc.

In other industries, where it has no value, collection pays attractive returns by preserving health of workmen, providing better working conditions—cleaner plants—cleaner products—and by reduction of operating costs.

HAVE YOU EVER INVESTIGATED

—the possibilities of dust control for your plant? Simply write us about your dust problem, and we shall be glad to advise fully—no obligation. There are thousands of Sly installations collecting over 100 kinds of dust. No doubt, our long experience can be of help to you. With our reply we'll send you Bulletin 98—a 24-page booklet showing how net income has been increased by dust control.

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In offering this Standard Stoker product, we also give you the benefit of more than a quarter century experience in producing precision built equipment.

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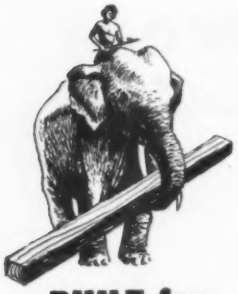

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CANADIAN PLANT: NEWMARKET, ONT.

New Products and Methods

without cart. Electric powered compressor mounted on a portable two-wheeled rubber-tired cart is $115.60; gasoline model, similarly mounted, is $119.90. Kellogg Div., American Brake Shoe Co.

41—INSULATED CLIPS

Come in a variety of shapes and wide range of standard sizes

These rubber insulated clips, clamps and fasteners are designed to prevent slipping, chafing, cutting and rattling in the securing of wire, loom, tube, pipe, cable and

rod. Exposed metal ends can be parkerized, zinc plated, cadmium plated, lacquered or enameled to suit customers needs. Special sizes and shapes are available to specifications.

Introduction of these clips, clamps and fasteners in standard sizes is intended to simplify the engineering job and promote economy and ease of ordering. Automotive Rubber Co.

42—MICROHARDNESS TESTER

Is mechanically operated for light load testing applications

The Model MO Tukon Microhardness Tester is described as accurate, easily operated and economical, and comes in floor and bench models. It applies loads of from 1 to 1000 g and may be used with either the knoop or 136 deg diamond pyramid indenters.

Load is applied under dash pot control, speed of which may be varied from less than 0.040 in. per min to as fast as testing permits without impact influencing results. Both rate of application and duration may be controlled. A special arrangement is designed to permit removal of load without operator touching instrument until indenter is out of impression.

Focusing impression under microscope is done through elevating unit with vernier adjustment. This is intended to eliminate need for coarse and fine adjustment on microscope. The Microton, (supplied as standard equipment), a mechanical stage for making indentations in small areas, is used for locating indentations. Microscope is illuminated by 110 v, 50 or 60 cycles, a-c. Wilson Mechanical Instrument Co., Inc., American Chain & Cable Co.

43—ELECTRODE HOLDER

Is miniature inert-arc type, with flexible "goose neck"

Here's an electrode holder with flexible front-end assembly of malleable copper tubing surrounded by a sheath of silicone rubber so it can be bent in any direction to reach hard-to-get-at places. Specifically designed for fluxless welding of non-ferrous metals in the thinner gages from No. 16 to No. 40 (0.0625 to 0.003 in.), the holder is available in two models: one for 0.010- and 0.020-in. tungsten electrodes and the other for 0.040- and $\frac{1}{16}$-in. tungsten electrodes. It has a rating of 40 amp continuous, and can be used with either a-c or d-c supply. Currents as high as 60 amp can be used, if overheating is prevented by very low duty cycles.

Small, light, and extremely adaptable, the new welding tool will find application in the manufacture and repair of control and measurement equipment, capillary tubing, electronic tubes, duct work, wire fittings, small sheet metal enclosures. Holder can be used with stainless steel, aluminum, brass, copper, nickel, Monel, Inconel, gold, silver, and tantalum and other metals.

According to manufacturer, the miniature holder is fitted to do a job wherever (1) metal to be welded is thin or parts to be welded are small or hard to get at.

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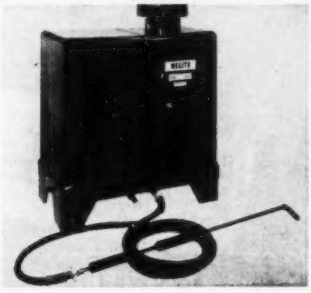
(2) the flux corrosion incidental to brazing is undesirable, or (3) the accessibility necessary for spot welding is lacking. The ability to weld easily-formed thin sheet metals readily, it is pointed out, will allow their substitution for other materials in making appearance mock-ups of projects and in the manufacture of containers.

At present, the miniature holder is being used by manufacturer to weld 0.003-in. stainless steel butt joints, 0.020-in. fernico cups to steel electronic tube bases, 0.010-in. nickel edge joints, and the laboratory and development projects. Welding Div., General Electric Co.

44—STEAM CLEANER

Is compactly designed and has high rated capacity

Measuring only 44 in. wide, 24 in. deep, and 45 in. high, the Model Q Steam Cleaner lists for $398.00 completely equipped. Its compact design and high output (110 gal of solution vaporized per hr.) is credited to simplification and rearrangement of all elements. All basic features of manufacturer's line, such as automatic type pump, all-steel welded construction, automatic



fuel regulator, automatic safety shut-off, high velocity nozzle and aerated gun trips, are incorporated in the Model Q.

A completely enclosed cabinet type, it is said to require no special skills to operate. The stationary model weighs 465 lb. Portable models available at higher prices. Kelite Products, Inc.

45—TANK FLOAT SWITCH

For automatic control of liquid level within closed tanks

No. 9037 Type EG tank float switch for condensate pumps is flange mounted; it is said to be especially applicable to vertical mounting but may be mounted horizontally as well. Adjustments permit contacts to open or close on liquid rise in either position, according to manufacturer, who points out that without removing the switch from an installation, float travel may be adjusted within moderate limits by removing cover and adjusting two lock nuts. Switch is designed to function properly under a pressure of 25 psi.

Enclosure consists of a steel frame with a slip-on steel cover finished in blue-gray enamel and built to NEMA No. 1 specifications. A water-tight seal is said to be insured by a graphite coated asbestos, used in the stuffing box. Square D Co.

46—PLATE MAGNETS

Permanent, non-electric type are now stronger and lighter

Redesign of manufacturer's line of permanent non-electric Standard and Jumbo plate magnets has resulted in a 50 per cent increase in magnetic strength and a 30 per cent decrease in weight, it is reported. These magnets now offer greatly increased magnetic protection at no increase in price, manufacturer states, adding that their lighter weight and compact construction will permit easier installation in less space.

Magnets consist of a series of Alnico castings designed to obtain great external energy. These magnets are intended to remove tramp iron from materials traveling in chutes and sprouts or in pneumatic lines and to provide protection for machinery, guard against fires and explosions and eliminate ferrous metal contamination.

Available for installation in metal or wooden chutes, feed tables, hoppers, with or without hinges. Sizes range from 4 to 72 in. wide in increments of 2 in. Eriez Mfg. Co.

47—DUAL-FUEL DIESEL

Is redesigned to provide for increased power output

Redesign of company's Series 21-8A Diesel engine is described as providing 38 per cent more horsepower per cylinder for stationary service. Also the redesigned engine can be arranged for dual-fuel operation, with easy changeover from gas to oil, and oil to gas. A 2-cycle engine with 21½-in. bore and 27½-in. stroke, this Diesel is now rated for 60-cycle generating sets at 520 hp per cylinder, 277 rpm. This is the net power developed at 100 per cent load, the power available at the shaft after allowing for blower requirements. The increase in horsepower has been obtained with no increase in compression or firing pressures, and practically no increase in temperature according to manufacturer, with brake mean effective pressure held to 74.5 psi while speed is kept within limits of good practice.

Principal changes include: placement of rotary valves in the exhaust outlets which close while intake ports are closing, to entrap approximately a 40 per cent larger volume of air for burning more fuel; enlargement of combustion chamber to permit better scavenging and no increase in compression pressures; intercooling of scavenging air, and automatically throttling the intake of the blower at reduced loads. Lima-Hamilton Corp.

Protection

(Continued from page 34)

starter on the reduced voltage step of the auto-transformer, reactor or resistor. The relay is connected across the line in series with a normally closed contact on the running breaker during starting. When the running breaker closes, the relay is disconnected. If, however, the starter fails to complete its sequence, the relay will trip and open the coil

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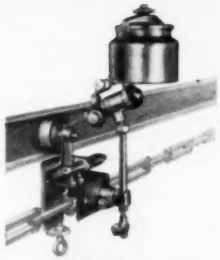

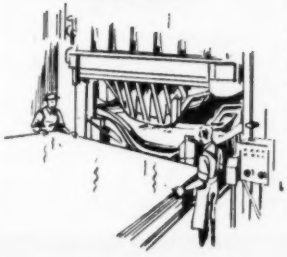

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WRITE for Bulletin LUB 8-49

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circuit of the starting contactor or breaker.

Limit Protection

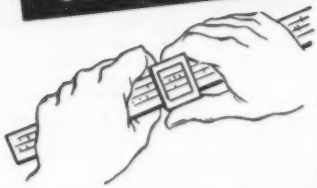
Prevention of over-speed, over-travel and over-torque fall into the category of limit protection. This is protection for the motor or the machine and is usually accomplished by means of limit switches which open the starter when the machine reaches its limit.

Interlocking Protection

Interlocking should be considered a form of protection since it is used to prevent one machine from operating out of relation to another. An example of this is a machine which must have its oil circulating pump running before the main drive starts. In this case the main motor starter is prevented from starting by an interlock contact in the oil circulating starter. When the circulating pump is running, the main motor can start. Interlocking the operation of one machine with that of another is usually quite simple and can often prevent trouble.

It should be remembered that there are certain functions which cannot be left to the control alone. For example, the control cannot impart torque to the motor. This is a matter of motor type and design. If the machine is overloaded so that the motor cannot get up speed or stalls the control can only limit the motor current or disconnect the motor from the line before it burns out.

Buschman
TROLLEY CONVEYORS



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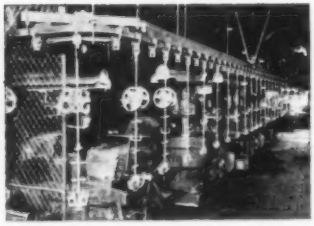

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Jenkins PRACTICAL PIPING LAYOUTS 44

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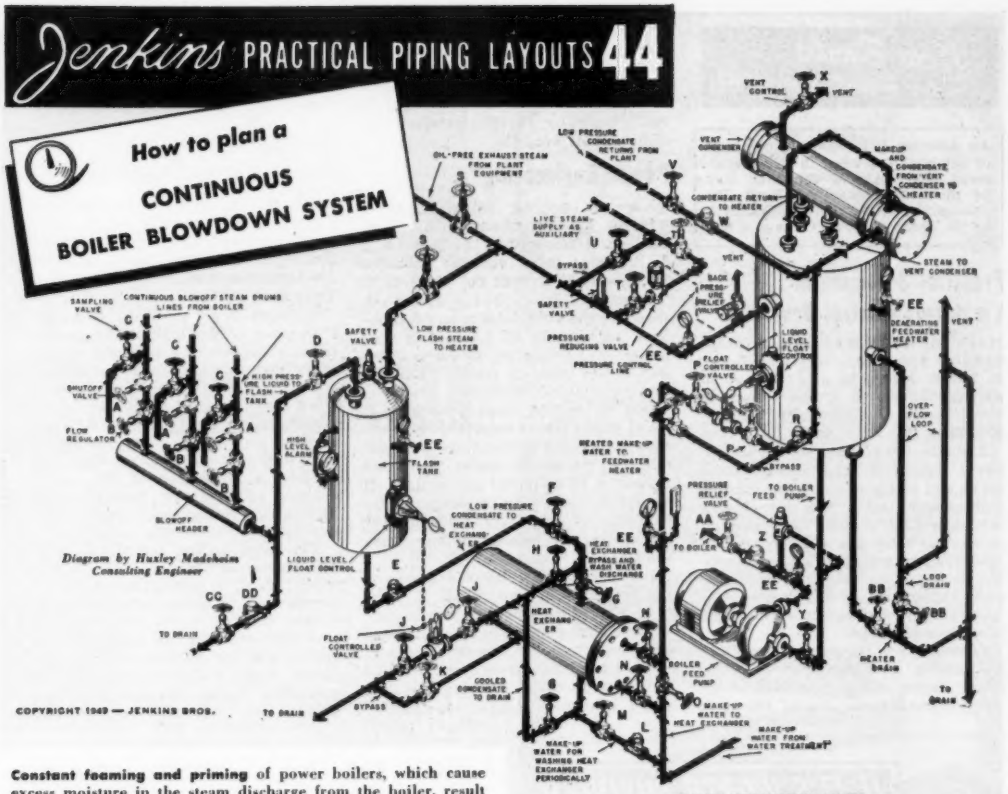

Diagram by Huxley Madeheim Consulting Engineer

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Constant foaming and priming of power boilers, which cause excess moisture in the steam discharge from the boiler, result from high concentration of dissolved or suspended solids prevalent in the boiler water. Some method of boiler blowdown is required to rid the boiler of these troublesome solids—to avoid unsatisfactory boiler operation and deterioration of boiler tubes. **The continuous blowdown system** shown has the advantage of keeping solids concentration at a uniformly low level and also of utilizing practically all the heat in the blowdown discharge.

This system can be adapted to boilers of any pressure rating, but the valves used on the blowdown lines from the boiler must always be of the corresponding boiler rating. The Jenkins Valves recommended here are for a 300 lb. boiler. Selection can be made for other pressures from the complete Jenkins line.

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VALVE RECOMMENDATIONS
For details and valves to suit varying conditions see Jenkins Catalog

CODE	Quan.	Jenkins Valve	Service
A	3	Fig. 280 Bronze Gate	Shutoff Boiler Drum Connections to Blowoff Header
B	3	Fig. 976-A Bronze Globe	Control Blowoff to Blowoff Header
C	3	Fig. 976-A Bronze Globe	Sample Boiler Water Shutoff
D	1	Fig. 280 Bronze Gate	Shutoff Feed to Flash Tank
E	1	Fig. 92 Bronze Swing Check	Prevent Backflow to Flash Tank from Heat Exchanger
F	1	Fig. 47 Bronze Gate	Shutoff Liquid Discharge from Flash Tank
G	2	Fig. 47 Bronze Gate	Shutoff Condensate to Heat Exchanger
H	1	Fig. 47 Bronze Gate	Bypass Heat Exchanger
J	2	Fig. 370 Bronze Gate	Shutoff Float Control Valve
K	1	Fig. 106-A Bronze Globe	Float Controlled Valve Bypass
L	1	Fig. 92 Bronze Swing Check	Prevent Contamination of Make-up Water
M	1	Fig. 106A Bronze Globe	Manual Periodic Washing of Heat Exchanger
N	2	Fig. 47 Bronze Gate	Make-up Water to Heat Exchanger
O	1	Fig. 47 Bronze Gate	Heat Exchanger Bypass of Make-up Water
P	2	Fig. 370 Bronze Gate	Float Controlled Valve Shutoff
Q	1	Fig. 106A Bronze Globe	Float Controlled Valve Bypass
R	1	Fig. 92 Bronze Swing Check	Prevent Backflow
S	2	Fig. 651 I.B.B.M. Gate	Steam to Feedwater Heater
T	2	Fig. 280 Bronze Gate	Pressure Reducing Valve Shutoff
U	1	Fig. 976A Bronze Globe	Pressure Reducing Valve Bypass
V	1	Fig. 47 Bronze Gate	Low Pressure Condensate to Feedwater Heaters
W	1	Fig. 92 Bronze Swing Check	Prevent Backflow from Heater
X	1	Fig. 106A Bronze Globe	Vent Flow Control
Y	1	Fig. 47 Bronze Gate	Boiler Feed Pump Suction
Z	1	Fig. 962 Bronze Swing Check	Prevent Backflow to Pump
AA	1	Fig. 280 Bronze Gate	Boiler Feed Pump Discharge
BB	2	Fig. 106A Bronze Globe	Drain Valves
CC	1	Fig. 970 Bronze Globe	Blowoff Header Drain
DD	1	Fig. 962 Bronze Swing Check	Prevent Backflow to Blowoff Header
EE	4	Fig. 741-G Bronze Needle	Pressure Gauge Control

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Practical Servicing of Electronic Control Devices*

MAINTENANCE MANUAL OF ELECTRONIC CONTROL, edited by Robert E. Miller. Size 6 by 9 in.; 304 pp including index; 16 reference charts; cloth bound. Published by McGraw-Hill Book Co. Price $4.50.

A COLLECTION of nine articles on different aspects of installation, maintenance and repair of electronic controls, each written by a specialist in the particular field treated. After chapters on electronic circuits and general considerations in installing and maintaining electronic control, there is a complete explanation of the construction, operation and applications of the cathode-ray oscilloscope.

Following are chapters on installing, maintaining and servicing electronic relays, timing relays, photoelectric relays, electronic motor control, electronic resistance-welding control, electronic temperature-control systems, and sealed-ignition rectifiers. The text is non-mathematical, although detailed. The numerous circuit diagrams can be easily read by anyone familiar with radio circuit symbols.

Power Engineering*

HOW TO SOLVE PROBLEMS IN STEAM POWER ENGINEERING by Stephen J. Tracy, Jr.; 152 pages; size 5½ by 8½; paper binding; published by Thomas Y. Crowell Co. Price $1.25.

DIFFICULTY in applying textbook theory to the solution of practical problems, particularly in the field of heat power engineering, led to the publication of this book. It provides comprehensive problems embracing the application of all the basic principles of steam power theory together with complete step-by-step solutions for each phase of the subject rather than mere variations of a limited set of data. It should be especially valuable to the man who is trying to study steam power engineering by himself or by correspondence.

Part I shows solution of problems in the properties of steam; Part II problems in the steam-power cycle including the steam engine, the steam turbine, the reheat cycle, the regenerative cycle and the combined fluids cycle. Part III shows solutions of problems in the steam generator such as, combustion, steam generation and heat balance. Part IV covers auxiliary steam power apparatus such as, pumps, condensers, heaters, evaporators, air preheaters, injectors and steam power plant piping.

Overloaded Branch Circuit Troubles

BRANCH CIRCUIT OVERCURRENT PROTECTION. Size 8½ by 11 in.; 52 pp; paper bound pamphlet. Publication No. R-9 of the Edison Electric Institute, 420 Lexington Ave., New York 17, N.Y. Price $1.00 (USA).

SUMMARY of a 2 yr survey of a Joint Committee of the Institute on protection and failures in low voltage circuits of 30 amps or less used for interior wiring. While the publication deals almost entirely with customers branch circuits involving household or commercial appliances, it incorporates a great deal of valuable information. This includes a breakdown of fire causes, analysis of trends in branch circuit loadings and ratings, and current carrying capacities of circuits.

This latter section includes detailed data on the performance of several different types of conductors in air, in panels, and in panel with insulation. Similar data is given on short time current characteristics for typical branch circuits and for flexible cords. Branch circuit demand curves and proposed protective device characteristics are covered in considerable detail as are

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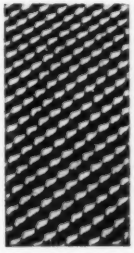

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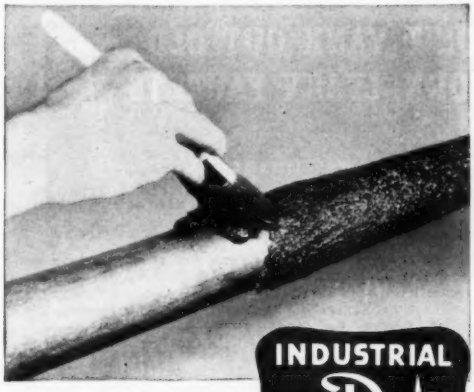

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**Facts are from an article titled "Direct-Fired Unit Cuts Heating Costs"—printed in OPERATING ENGINEER, Nov., 1948. Copy of the article will be sent upon request.*

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Sections on the economics of branch circuit design, and studies on the effect of frequency starting of motors on the temperature rise of branch circuits are particularly good.

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ORGANIZATIONAL TEAMWORK IN PRODUCTION. Size 6 by 9 in.; 32 pp, paper bound. Published as Production Series Booklet No. 184 by the American Management Assn., 330 West 42nd Street, New York 18, N. Y. Price $0.75.

REPRINTS of four papers presented at an association conference. The first paper dealing with material handling contains considerable material on plant lay-out, best utilization of floor space and determination of effective working areas. The other papers are entitled: Management Control of New Product Design; Coordinating Production with Sales; and Getting Flexibility into Organization and Machinery. The last three are of possible interest to plant engineers as case studies of effective departmental cooperation.

Where to Find the Dope

SOURCES OF ENGINEERING INFORMATION by Blanche H. Dalton; 110 pages; size 6 by 9 in.; cloth binding; published by the University of California Press, Berkeley 4, Calif. Price $4.00.

THIS IS a very practical guide to engineering literature and data designed for students, practicing engineers, research workers and librarians. Its arrangement is based on studies of the use of an actual library and enables the technical man to find the key problems previously published in a particular field. The volume covers every type of engineering, important source material is briefly desecribed and its use explained. The book does not list the specific items you may be looking for but tells you how to go about finding them in a given field.

Short Course in Materials Handling

INDUSTRIAL PACKAGING AND MATERIALS HANDLING. University of Illinois bulletin. Size 6 in. by 9 in.; 248 pp; paper bound; published as Circular Series No. 56 by Engineering Experiment Station, University of Illinois, Urbana, Ill. Price $1.00.

A REPRINT of 44 papers from the first short course on industrial packaging and materials handling conducted by the university at Chicago in October 1948, in cooperation with the Soc. of Ind. Pkg. & M. H. Eng.

The following are of particular interest to the plant engineer: Plant Layout from a Materials Handling Standpoint; The Principles of Materials Handling and the Materials-Handling Engineer; A Review of Cleaning and Rust Prevention; A Case History in Carloading, Bracing, and Blocking; and Rules and Regulations for Loading.

A Useful Handbook

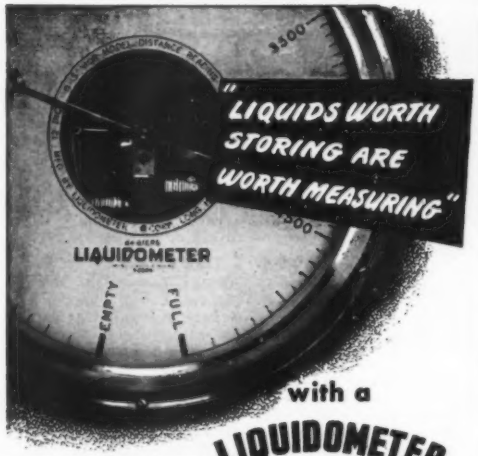
DE LAVAL HANDBOOK. Edited by Austin A. Church and Hans Gartmann. Size 5½ by 8 in.; 265 pp. plus index and an 18 pp catalog section. Published by De Laval Steam Turbine Co. Trenton 2, N. J. Price $2.00.

THIS IS A second edition of a handbook brought out in a limited edition in 1947. It was compiled by the company's engineering staff specifically for users of pumps, turbines, compressors and gears. While the book is small, the contents have been well selected and well arranged so as to be of maximum value to the practicing engineer.

Approximately a third of the book is devoted to a general engineering section covering commonly used mathematical tables, formulae, and technical data, including beam formulae, metal gauges, horse power and power transmission charts, pipe dimensions, various standards, conversion tables, steam tables, viscosity and pipe friction. A short miscellaneous data section touches electric motor data and economic studies of obsolescent equipment. Where possible the data has been presented in graphical form, a short discussion of the subject, the chart, and directions for using the chart.

Other sections are devoted to centrifugal pumps, gear pumps, centrifugal compressors and reduction gears, that is equipment made by the company. The handbook deals with the subject in

(Continued on page 80)



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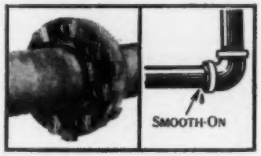

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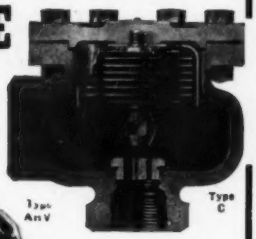

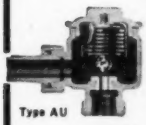

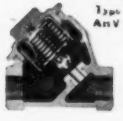

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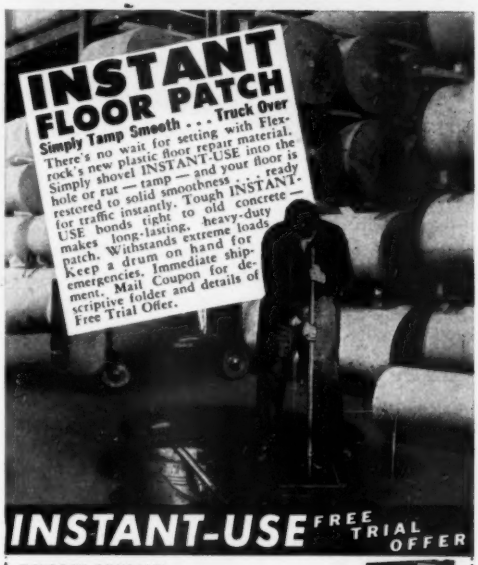
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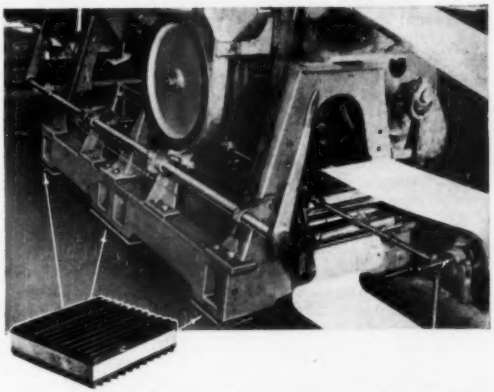

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(Continued from page 76)

general, however, with no reference to any particular make of equipment except for an occasional drawing used for illustrative purposes. Each section covers that particular type of equipment from the standpoint of selection, use, installation and maintenance.

All About Trade-Marks*

TRADE-MARKS by H. Bennett. Size 5½ in. by 8½ in.; 479 pp, cloth bound; 1949. Published by Chemical Publishing Co., Inc. Price $10.00.

INCLUDING MUCH information never before published, this book outlines the legal aspects of trade-mark registration and protection in the United States and foreign countries. The author explains the principles of trade-mark selection and describes four methods of coining original names. Most valuable are comprehensive alphabetic lists of trade-mark chemicals, textile specialties, plastics, elastomers, alloys and allied products, showing chemical composition and manufacturers. A pocket in the back cover contains four "name finders," gadgets made on the circular slide rule principle, quickly showing practically all pronounceable combinations of the alphabet in words up to 6 letters.

For Junior Engineers

A PROFESSIONAL GUIDE FOR JUNIOR ENGINEERS by William E. Wickenden. Size 8½ by 11 in.; 56 pp; paper bound. Published by the Engineers' Council for Professional Development, 29 West 39th Street, New York 18, N. Y. Price $1.00.

A SOMEWHAT academic discussion of the history, heritage and responsibility of the engineer and his professional relationship. It is of value to young engineers or to older engineers concerned with occupational guidance. Appendix A covers an excellent list of reading for junior engineers, and Appendix B a Self-Appraisal Questionnaire, for those interested in picking out a future career and in gaining knowledge poise and understanding as time goes by.

NO NEED TO SHOUT

Use a Burgess-Manning Acousti-Booth —provide a ZONE-OF-QUIET for Ease of Telephoning

EVEN in the noisy surroundings of the drop-forge shop, you can hear well and talk without shouting in a Burgess-Manning Model 211 Acousti-Booth.

For 7c a day you can provide a quiet place to telephone—a small price to pay to hear clearly . . . day after day . . . in noisy locations . . . where accuracy of hearing is essential.

Model 211 has sound-absorbent walls that soak up noise . . . provides a quiet spot for telephoning. Airy, easily moved, compact.

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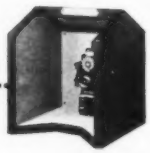

"Scout" Model 602 is ideal for noisy, congested locations in factories, stores, offices. Rugged all-steel construction.

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Please send illustrated booklet describing the Burgess-Manning Model 211 Acousti-Booth.

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Power Plant Maintenance

TURBINE AND BOILER OVERHAUL PRACTICE. Size 8½ by 11 in.; 34 pp; paper bound pamphlet. Publication No. R-13 of the Edison Electric Institute, 420 Lexington Ave., New York 17, N. Y. Price $1.25 (USA).

THIS IS A summary report of the Turbine and Condenser Sub-Committee of the Primer Movers Committee of the Institute. It is divided into four sections: summary, introduction, general overhaul practice; and methods for inspection of specific items. It covers only turbine generators and boilers in utility plants, in general, meaning only large units. It is, however, valuable for industrial companies as a check list against their own practice and details of procedures for specific equipment.

Manuals for Steel Users

STEEL PRODUCTS MANUAL. Size 6 by 9 in. Section 16, 174 pp covers Carbon Steel Wire. Section 28, 82 pp covers Alloy Steel Wire. Published by the American Iron and Steel Institute, 350 Fifth Ave., New York 1, N. Y. Price each section, $0.25 per copy.

UNDER THE general title Steel Products Manual, the Institute publishes 29 Sections each dealing with a specific steel product. In general all these booklets follow the same arrangement, divided up into several parts as follows: metallurgical aspects; manufacturing practices; commodity descriptions; chemical requirements; tables of wire gauges and other data; packaging, marketing and loading methods; and index.

Section 16 on Carbon Steel Wire was originally published in October 1939. It has gone through various revisions the latest being July 1949.

Section 28 on Alloy Steel Wire is a new section issued August 1949.

Water Cooling Problems?

ENGINEERING DATA MANUAL FOR WATER COOLING PROBLEMS; 72 pages; illustrated; size 8½ by 11 in.; paper binding; published by the Marley Co., Inc.; Fairfax and Marley Roads, Kansas City 15, Kansas. Price $1.50.

THIS IS A handbook for engineers who encounter water-cooling problems and/or who use water-cooling equipment. It discusses properties and psychrometry of air; dry bulb and wet bulb design temperatures; spray pond design data, air washer recommendation, dimensions and weights of standard pipe; and friction tables for cast iron, steel and redwood pipe.

Data are also presented on the terminology, fundamentals, operating terms and mechanics of atmospheric water cooling, various types of refrigeration units, compressors, condensers and internal combustion engines; properties are given for common refrigerants.

Structural data on lumber and fastenings have been tabulated. Also wind-pressure data, fan laws and performance, noise measurement and sound analysis. Typical heat-flow diagrams for condensers, refrigeration and other processes are shown with a section on water treatment as a factor in effective heat transfer in cooling equipment.

What We Want Most in Employees

THE MOST DESIRABLE PERSONAL CHARACTERISTICS. Size 6 in. by 9 in.; 25 pp; paper bound. Published by the Engineers' Council for Professional Development, 29 West 39th St., New York 18, N. Y. Price $0.25.

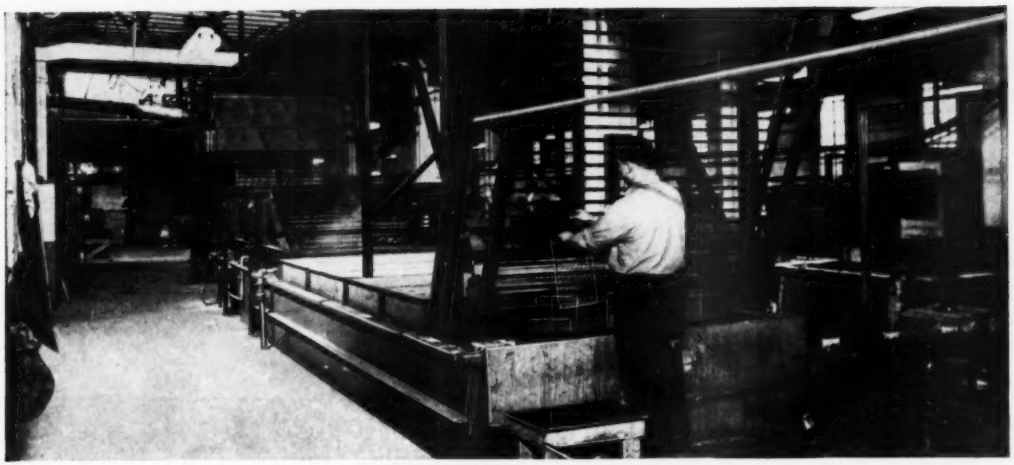
A WELL WRITTEN but poorly presented study of almost universal interest. It presents the data of a 3-yr survey to provide facts about human personality valuable in professional development. Intelligence in this study was rated first, dependability second, organizational adaptability third, energy is fourth, and emotional or physical acceptability as fifth and sixth.

Returns from engineering school administrators, faculty, personnel advisers, students and industrial executive groups agreed remarkably well although there was considerable difference in the desirable characteristics for such diversified groups as general engineering, research, engineering design, production, sales and distribution.

KIRK and BLUM FINISHING SYSTEM

CLEANS..DRIES..LACQUERS..BAKES

. . . 360 to 700 Wire Shelves Per Hour at the Bauer Brothers Co., Springfield, Ohio

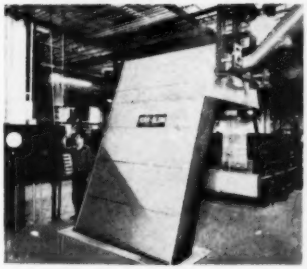


PRODUCING a clear lacquer finish that withstands rigid acid and abrasive tests, the Kirk & Blum Finishing System shown in these photographs carries wire refrigerator shelves through six operations from loading to packing for shipment. Two to four men operate the system which handles 360 to 700 shelves per hour, depending on size.

The operations are: 15-minute soak wash, cold rinse, hot rinse, drying lacquer dip and 15-minute bake at 250°. One man loads, while two men unload and pack in cartons. Cleaning operations are on the first floor of the plant, lacquering and baking operations in the basement directly underneath. Fume control for removal of fumes and products of combustion is a part of the system.

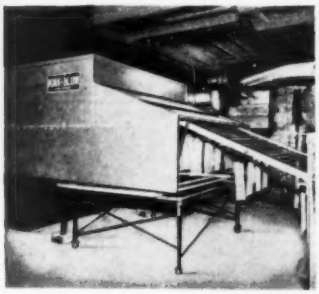
This system is an example of the way Kirk & Blum Engineers design, fabricate and install systems to exactly meet requirements in plants large and small across the nation. Users are assured an efficiently operating system from *one* responsible manufacturer, ready to operate.

Kirk and Blum has more than 40 years of experience in the drying and baking field at your service. Write for catalog, "Industrial Ovens."

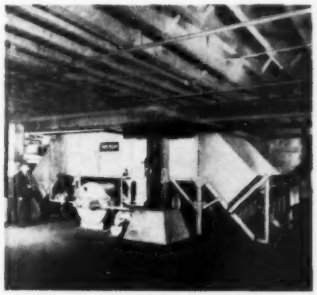


2 . . . leave cleaning tanks, go down through drying tunnel . . .

1. Shelves are loaded, start through cleaning operations . . .



3. To lacquer dip below, drain and then . .



4. Through baking oven and back up to unloading station.

KIRK AND BLUM

INDUSTRIAL OVENS

THE KIRK & BLUM MANUFACTURING CO.
2889 Spring Grove Ave., Cincinnati 25, Ohio

YOU CAN BE **SURE**.. IF IT'S

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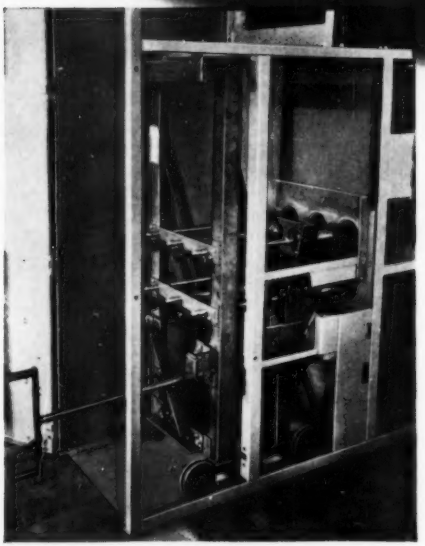
perfectly into a
tionary structure.



Every stationary structure is checked for alignment with a master removable element.

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This perfect alignment is accomplished, first, by fitting all removable elements to a master stationary structure in the breaker assembly section; second, by matching all stationary structures to a master, tool-built, removable element in assembly operations. The result is positive alignment of rails and wheels; main, auxiliary and ground contacts; shutter and main levering-in device.

These master tool elements are checked against each other periodically with precision "go—no go" gauges to insure that their accuracy is maintained.

Double-checking for "sure fits" eliminates the necessity for fitting on the job. It provides for swift, easy, interchangeability of breakers when the switchgear is in service. It's another means of making you *sure* when you specify Westinghouse Metal-Clad Switchgear.

For complete information about the 10 big advantages of Westinghouse Metal-Clad Switchgear, send for booklet B-4016. Address Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

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